



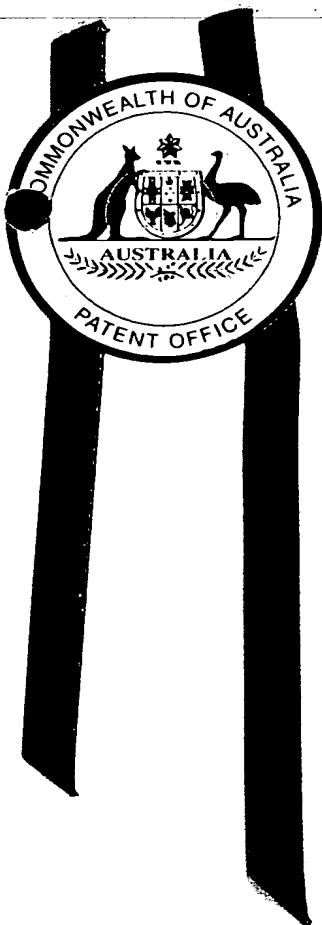
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Patents Act 1990

**ORIGINAL**

**PROVISIONAL SPECIFICATION**

**CABLE GATE**

**The invention is described in the following statement:**

## CABLE GATE

### **FIELD OF THE INVENTION**

The present invention relates to an improved gate, and in particular to cable or chain security gates, and may for example be used to replace existing 5 boom and security gates.

### **BACKGROUND OF THE INVENTION**

Conventional gates are used either to prevent unauthorised access to a site (security), or for access control purposes.

Security gates prevent vehicular access and are constructed in a variety 10 of formats. Typical examples incorporate sliding, swinging, or vertically raising (or lowering) panels, and are constructed of steel tube, wood, steel mesh, plastic, other materials, or combinations of these materials. The gates may be manually opened, or may utilise one of a number of alternative hydraulic, electrical, electro-hydraulic, or other actuation mechanisms. Automatic control 15 devices may also be provided, to allow for remote (wireless) or security system opening of the gate. As well as preventing unauthorised access, these gates also provide access control.

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Another form of access control gate is the boom gate, constructed typically of a long wooden or steel beam pivoted about a horizontal axis at one 20 end. Applications include access control into public car parks, and as warning devices at railway level crossings. Boom gates are used more for access control, than security purposes, as it is not very practical to construct them strong enough to prevent deliberate unauthorised access. These gates may also be automatically, manually, or remotely opened and closed.

25 A number of functional weaknesses may be noted for most conventional gates, particularly automatic gates.

Most automatic gates are quite expensive to purchase and operate, as the gate panels are heavily and expensively constructed, their actuation mechanisms are large and costly, mechanical and electrical or hydraulic 30 services must be installed and connected between the gate and a suitable source, and considerable work is needed to provide the foundations for the necessarily precise gate mechanisms.

Existing gates are also not very space efficient. For example, a swinging gate must have room for the gate panels to swing into, and the panel of a sliding gate requires at least the full opening width again, behind an associated fence. Similarly, poles that are raised telescopically from a hole in the ground require 5 substantial below-ground excavation, and are prone to jamming due to the ingress of sand and water.

Further, many gates are not constructed strong enough to withstand deliberate attempts at unauthorised access, and most automated gates are relatively slow to open (for safety reasons).

10 Conventional swinging, sliding, or raising gates also tend to be quite slow to open and close, particularly if they are built heavy and strong to withstand deliberate attempts at unauthorised access. The reasons are twofold. Firstly, the inertia of these types of gates is large, requiring high accelerating forces to achieve reasonable speed of operation. This would require large and 15 expensive actuation mechanisms, making the whole approach commercially unattractive. The second, and more important reason, is that heavy gates travelling at high speed (and using high forces) would present a serious hazard to personnel, animals, and equipment such as vehicles. This is because, due to the extremely high inertia levels that would be involved, their overload 20 protection and other safety devices would be rendered ineffective. This is particularly the case if the gates are automatic, and therefore may be operated unintentional, or unexpectedly.

Slow opening times can be particularly annoying to the user, who may need to make regular authorised accesses to a secure site. For example, this 25 may include a home owner entering his own property, or someone wishing to legitimately enter a private parking area. Generally, it is usually not so important for the gate to close quickly.

#### OBJECT OF THE INVENTION

It is an object of the present invention to provide a gate which addresses 30 at least one of the weaknesses of conventional gates identified above. In particular it is an object of the present invention to provide an improved gate that is low in power consumption, space efficient, fast to open, in-expensive to

manufacture and install, intrinsically safe, and ideally automatic and more effective in restricting deliberate attempts at unauthorised vehicular access.

#### SUMMARY OF THE INVENTION

With the above object in mind the present invention provides in one 5 aspect:

a gate for controlling passage through an opening including:

a first support means located on one side of the opening;

a second support means located on the other side of the opening;

at least one elongate member extendable across the opening between

10 said first and second support members; and

a control means for releasing said at least one elongate member to thereby enable passage through said opening, and drawing in said elongate member to thereby restrict passage through said opening.

In the preferred embodiment the elongate member could be a cable, or 15 alternatively a chain, rope, cord, rod or pipe provided with flexible end fittings, or similar arrangement.

In a further preferred embodiment, the first and second support means could be posts. Alternatively, walls, or many other forms of architectural structures (for example columns, arch supports, beams, light poles, or even 20 statues), could form the support means.

Preferably, the control means would be located substantially wholly within one of said first or second support means, to limit access to said control means.

The gate could further include a locking means to prevent unwanted 25 release of the at least one elongate member once the at least one elongate member has been fully drawn in. Conveniently the locking means could include a latching means adapted to engage a thimble assembly attached to the at least one elongate member.

Preferably the gate further includes a first line connecting said at least 30 one elongate member to said control means such that said control means operates to draw in said first line thereby drawing in said at least one elongate member. Ideally, the first line is thin and lightweight, for example it could be a

steel or synthetic cable or strap. Further, the first line could be attached to said thimble assembly.

The first and/or second support means may further include a first tracking means to draw said at least one elongate member towards said first support means during release of the at least one elongate member. The first tracking means may include an aperture in said first support means through which a counterweight line may pass. One end of said counterweight line being attached to said at least one elongate member, and the other end attached to a counterweight.

10 Ideally the aperture would be located a predetermined distance below said at least one elongate member and substantially equal to the distance between said first support means and a point where said counterweight line is attached to said at least one elongate member.

15 A further improvement to enable tracking of the said at least one elongate member along a side of said first support means would include a bar running along an end portion of said at least one elongate member, and adjacent to said first support member.

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Where a plurality of elongate members are provided, it may be preferable to provide a bar, running along an end portion of each, or a selection of, the 20 elongate members, to further improve tracking.

Alternatively, said at least one elongate member is connected to a bar pivotally attached to said member.

Alternatively, a resilient means could be utilised in place of said first tracking means.

25 The control means will preferably include a winch means including: a winch drum fixed to a drive shaft.

Preferably, however, the control means could include a winch means including:

30 a winch drum adapted to freely rotate on a drive shaft;  
a drive collar rotatable with, and slidable along, said drive shaft;  
an engaging means adapted to enable said drive collar to engage and disengage said winch drum.

Ideally, a braking means is provided to limit the speed of the winch drum when not engaged with said drive collar.

In a further preferred aspect the present invention provides a second tracking means to track said first line along said winch drum including:

- 5        a fixed pulley;
- a second pulley mounted on a arm, said arm being spring loaded and capable of swinging;
- wherein said first line tracks around said fixed pulley and then said second pulley prior to being wound on said winch drum.

- 10      In another preferred aspect the present invention provides an improved latch mechanism including:
  - a latch or locking pin adapted to be released by a release lever;
  - a first and a second spring each fixed at one end;
  - a belt passing around a pulley means and connecting said first spring to
- 15      said second spring; and
- a release line attached to said release lever and said belt.

Conveniently, the release line may pass through the centre of the first spring.

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In the preferred embodiment of the present invention the latch mechanism would be driven by said winch means. Further, the release lever would also include a return spring adapted to return the release lever to a locked position.

In a further aspect the present invention provides a latch mechanism including:

- 25      a latch or locking pin adapted to be released by a release lever;
- a member attached via a ratchet means to a winch means; and
- a release line joining said release lever to said member.

In some applications it may be desired to provide a series of gates as defined by the present invention. In such an arrangement a predefined distance may be left between adjacent gates, or alternatively two adjacent gates may have a common support means.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further described with reference to the accompanying drawings. It will be appreciated by the person skilled in the art that other embodiments of the present invention are possible, and therefore the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

5 Figure 1a shows the basic format of the improved gate in both a closed and open configuration.

Figure 1b shows the master post of the preferred embodiment.

10 Figure 2a shows the cable configuration in relation to the master post.

Figure 2b shows the locking mechanism of Figure 1b.

Figure 3a shows the drive mechanism of the preferred embodiment.

Figure 3b shows the winching mechanism of the preferred embodiment.

Figure 4a and 4b shows the latch mechanism of the preferred embodiment.

15 Figure 5 shows the passive post arrangement of the preferred embodiment.

Figures 6a to 6e show the quick release arrangement of the preferred embodiment.

20 Figure 7 shows the winch braking arrangement of the preferred embodiment.

Figure 8 shows the cable tracking arrangement of the preferred embodiment.

Figure 9 shows the lock detecting arrangement of the preferred embodiment.

## 25 DETAILED DESCRIPTION OF DRAWINGS

Referring now to Figure 1, the present applicants have found it feasible to construct a security gate using steel cable or chain stretched between two anchor posts. By making the cable or chain permanently anchored at a first post, and capable of being fed out from, or drawn into a second post, it is possible to effectively open and close the gate to vehicular traffic. Alternatively, the cable or chain could also be fed out from, and drawn into the first post as well as the second post, if required. In the open position, the cable or chain

would be arranged to lie on the road or ground surface, or in a suitable groove, for vehicles to drive over. When closed, the cable or chain would form a barrier between the two posts, preventing access.

If high strength steel cable or chain had been previously considered for 5 the gate of the present invention then conventional teaching of a means for reeling the cable or chain into the post would have resulted in a necessarily large, heavy, expensive, and bulky apparatus. This is because the winch drum must be of sufficiently large diameter to accept the heavy cable or chain, and must be sufficiently strong to support the maximum tension loads if an attempt is 10 made to breach the gate. For steel cable, the winch drum must also be sufficiently large to prevent the cable from going below a minimum bend radius, thereby compromising the cable's fatigue life, or from being irreversibly distorted which will render it unusable in that it would not lie flat on the road.

Therefore, in the present invention, a high strength cable, preferably 15 steel, may be anchored to a passive post located to one side of an opening or roadway, and the other end of the main cable can be drawn into a master post located on the other side of the roadway, by means of a thin light-weight "pull-in" cable, as shown in Figure 2a. This second end of the main cable is fitted with a 20 thimble assembly (or similar), which can be locked into place in the master post by a latching mechanism once the gate is fully closed (refer to Fig 2b).

In the preferred embodiment a 10 mm diameter stainless steel wire rope forms the main cable, as this provides a suitably high level of strength, is corrosion resistant, is relatively difficult to cut, and does not cause undue damage to the road, or impede the passage of normal vehicles over it. 25 Depending on the application and strength requirements of the cable, longer or smaller diameter cable can be selected, or even synthetic cord or rope can be utilised.

It has been found that an 8 tonne force would be required to pull out a 10 mm steel cable from the master post of the present invention. Accordingly, the 30 selection of the post material and/or modifications of the post may be necessary dependent on the cable selected for the particular application, so as to ensure the gate works effectively, and that the post is not unduly weak.

The pull-in cable strength, and therefore diameter, should be selected to suit the main cable span, and diameter or weight of the main cable. Tests have shown a 2 mm diameter cable to be suitable for use with a 10 mm diameter main cable over realistic spans. Ideally, the pull-in cable is also a stainless steel 5 wire rope for its corrosion resistance, and should be of a flexible weave to enable the cable to lay neatly on the winch drum and pass easily over the pulleys.

Once it is in place and locked, then the main cable is unable to be withdrawn from the master post even at high force levels, unless the latch is first 10 unlocked. This is ideally performed by an internal mechanism, that is, a mechanism that is not readily accessible from the outside of the gate. The latching function may take the form of a pivoting pin (as shown in Fig 2b). This form of latch is in a sense self-energising, in that any attempt to withdraw the main cable only acts to more strongly hold the latch closed. It is necessary for 15 the pin to be rotated against the cable load, in order for the cable thimble to be released. A lever arm attached to the locking pin pivot shaft may be utilised to perform this unlocking function. Alternatively, a retracting bolt or other form of latch could be utilised.

The internal mechanism required to release the latch might take the form 20 of an electrical solenoid, which could for example pull back a bolt, an electric motor drive, a manually operated key assembly, or other similar means.

The present invention could be operated by a simple control system used to control operation of the electric motor, and of the unlocking mechanism. Additionally, micro-switches may be used to detect both the locked and 25 unlocked status of the gate.

The pull-in cable is not exposed to the security loads needed to be withstood by the main cable, and therefore need only be strong enough to draw, or pull-in, the main cable to the master post latch mechanism, and may therefore be constructed using quite small diameter wire rope, or even synthetic material 30 such as a nylon rope. The pull-in cable winch drum may similarly be constructed to be physically small, of low cost, and light-weight. In the preferred embodiment, the winch drum and winch shaft are made of inexpensive plastic

materials, and are small enough to be fitted within the master post. Similarly, the winch drive mechanism may also be constructed using small, light-weight, and inexpensive componentry. In the preferred embodiment, this drive mechanism makes use of a very low-cost electric motor and drive assembly, 5 such as normally might be used for high volume automotive application, for example driving windscreen wipers or window winders, that is mounted outside of the master post. Figure 3 shows this arrangement. Alternatively in some embodiments it may be feasible and preferred to mount a smaller drive motor inside the existing post, or to fit the prototype motor within a slightly larger post.

10 Manual methods may also be used to activate the winch mechanism. For example, a crank handle and ratchet mechanism could be used in place of the electric motor, or a single stroke foot driven treadle device, or even a pull rope wrapped on a spring returned drum could be utilised. Or, a simple rope could act directly as a pull-in cable, for a manually closed system.

15 The use of the pull-in cable in conjunction with the main cable provides a gate that is of low cost, is strong, and is considerably more space efficient than conventional gate formats. The small drive mechanism also has very low power-consumption characteristics, making it attractive for applications that are power sensitive, and may therefore be battery or solar driven and not just mains 20 driven.

In a preferred embodiment, the winch drive that draws in the pull-in cable may also be used to activate a latch release lever attached to the locking pin pivot shaft (when driven in the release direction). In this improved release mechanism, the release cable is activated from the pull-in cable winch drum 25 shaft, using the principles of a capstan drive. Figure 4 shows the format of one embodiment, which makes use of a V-belt system to keep the drive physically small. As can be seen from the reference to Figure 4a, when the winch is rotating to draw in the pull-in cable to close the gate, then due to friction on the belt, spring A will continue to stretch until the force in spring B approaches zero. 30 By this means the release cable is de-tensioned, allowing the pivoting latch to be returned to its locked position by means of a return spring. Thereafter, the winch may continue to reel in the pull-in cable, without spring A being further

stretched. This is because the V-belt is now able to slip on its pulley.

Similarly, when the gate is required to be opened the electric motor and winch shaft (carrying the V-belt pulley), are arranged to rotate in the reverse direction. This causes spring B to be stretched, carrying with it the release cable, which then acts on the pivoting latch release lever (Fig 4b). This action continues until the latch is able to unlock the main cable end, and until the force in spring A approaches zero. Note that until spring A is de-tensioned, the force that the V-belt may apply to the release cable is extremely high. This is because the tension in the belt will increase exponentially around the pulley (as per the action of a capstan drive). The length of spring A and the release cable is adjusted to ensure that the latch will fully dis-engage. Thereafter, the winch is able to continue to reel out the pull-in cable (allowing the main cable to drop, thereby opening the gate), without further stretching of spring B.

The release cable must be strong enough to retract the latch release lever, and ideally flexible enough to pass over a pulley. A 1.6 mm diameter stainless steel wire rope has been found suitable for this function. Conveniently, the release cable attached to the release lever, passes around a pulley, and through the centre of spring B, and is attached to one end of the belt.

The present invention therefore also provides a means of releasing the latch mechanism using a few small, simple, and inexpensive components, while at the same time providing a very high release force capability and may derive its power from the existing winch drive electric motor (or other) drive mechanism.

As an alternative to the latch mechanism disclosed above, the pulley, belt and spring arrangement could be replaced with a spool or arm attached to the main drive shaft by means of a ratchet arrangement. The release cable or line would attach to this spool or arm. When operating in the pull-in direction, the ratchet would allow the spool or arm to remain stationary as the shaft turns to draw in the first line. However, when the motion of the shaft is reversed, the ratchet would act to force the spool or arm to rotate with the shaft, thereby winding in and pulling the release line.

During development it was found that a point is reached during the opening cycle, once sufficient chain or cable has reached ground level, when

friction between the cable and the ground (or road surface) will hold the remaining chain or cable away from the passive post and thereby results in the opening width for traffic flow between the gateposts being effectively reduced.

Referring now to Figure 5, in the preferred embodiment, as the main cable is lowered by the master post, a counter-weight inside the passive post is able to pull in the cable against that post. This may be achieved via a small access hole in the passive post, a counter-weight cable, and one or more small pulleys. Similarly, as the main cable is raised to close the gate, tension in that cable acts through the counter-weight cable to raise the counter-weight to its normal (closed gate) position. A spreader bar attached to the cable can further improve the ability of the main cable to track along the side of the passive post, ensuring that the cable is drawn well into position adjacent to the post, for the full height of that post, thereby providing a greater effective opening between the posts.

15 In an alternative arrangement springs may be used in place of the counter-weight.

A further alternative is to include a bar as part of the cable. That is, the cable can be connected to a bar which is pivotally attached to the post. The cable and the bar then combine to extend across the opening. When the cable 20 is released, the weight of the bar would assist in causing the bar to pivot down along the side of the post, thereby drawing the cable. Alternatively, rather than being pivotally attached to the post, the bar could be joined to the post by a length of cable attached to the post and the bar.

As previously noted conventional gates are slow to open. In a preferred 25 embodiment the present invention provides a gate having safe, short opening times. This can be achieved as no hazard is presented by rapid opening of the gate, and gravity may be utilised to effect the short opening time.

In the arrangement shown in Figure 6, the winch drum is made free to rotate on the driven shaft (Figure 6b). A separate drive collar is attached to the 30 shaft in such a manner that it is forced to rotate with the drive shaft, but is free to slide along part of its length. In the preferred embodiment, the collar is located on the shaft by means of a pin passing through a slot in that shaft. Alternatively,

however, a spline joint or similar arrangement could be provided. This drive collar is provided with extending dogs (Figure 6b) that may be engaged into recesses in one of the winch drum end flanges, and a spring is used to hold the winch drum and drive collar apart. This provides a form of dog clutch between

5 the motor driven shaft, and the winch drum.

The opposite side of the drive collar is provided with extending cam followers, which engage with a face cam and hub also mounted on the drive shaft (Figure 6c). The cam hub is also free to rotate on the drive shaft, but only over a limited range of travel. This may conveniently be done by providing a

10 drive shaft arranged to engage in a segmented slot in the cam hub. By applying a suitable retarding force (eg. via a friction brake block, or similar), the face cam will be prevented from rotating as the drive shaft rotates, causing it to remain stationary until its travel limit is reached relative to the drive shaft (Figure 6d). Thereafter, the face cam and drive shaft will rotate together. As will be seen, this

15 cam arrangement is used to automatically engage and dis-engage the winch clutch. Conveniently the face cam, and the V-belt pulley previously described, could be manufactured as one unit. By this means the V-belt pulley is able to provide the necessary cam retarding force, thereby doing away with the need for a separate retarding system. It will be appreciated that other arrangements to

20 engage the clutch are also possible, and the various cam and clutch elements could equally be swapped between components. For example, the clutch dogs could form part of the winch drum, and the clutch recesses could be manufactured in the drive collar.

In the preferred embodiment, and starting with the gate fully open, this

25 quick release improvement operates as follows.

Referring to Figure 6d, the motor drive will commence rotating the drive shaft clockwise, and the V-belt pulley and face cam assembly will rotate with the shaft and drive collar until the forces in springs A and B become approximately equal. As further rotation occurs, the face cam will tend to be held stationary by

30 the V-belt pulley. However, the drive shaft and drive collar will continue to rotate. Therefore, the drive collar cam followers will be caused to ramp up the cam faces (Fig 6c), forcing the drive collar to slide along the drive shaft towards

the winch drum. By this means, the clutch dogs are caused to engage with the winch drum. This forces the winch drum to be rotated, drawing in the pull-in cable. The travel limits on the face cam prevent the cam followers from travelling beyond the point of maximum lift.

5 From this point the drive shaft, face cam, V-belt pulley, drive collar, and winch drum all continue to rotate as one. This process continues until the main cable is locked into the master post by the latch assembly, at which time the gate control system stops the drive motor. To cause a very rapid opening of the gate, the control system starts the drive motor in the opposite (in this case anti-  
10 clockwise) direction, when the following sequence of actions occur.

Firstly, the spring forces equalise as all components rotate as one, and the pull-in cable tension is released. However, the main cable is not released at this time. Next, the V-belt pulley and face cam assembly is again held stationary as the drive shaft and collar continued to rotate. This allows the cam followers to  
15 drop down the cam faces, thereby allowing the clutch spring to disengage the clutch dogs from the winch drum. Finally, however, the face cam travel limits are again reached, and the face cam and V-belt pulley assembly is caused to commence to rotate. This action causes the V-belt to pull the latch release cable (Fig 6e), thereby unlatching the main cable. The control system can stop the  
20 motor drive at this point. Because the winch drum is now free to rotate, the main cable rapidly falls away under the action of gravity, towing the pull-in cable with it. This completes the entire closing opening cycle.

It has been found that a brake block applied to the winch drum, is useful to prevent uncontrolled reeling of the pull-in cable. Spring tension may be used  
25 to apply the brake force. In addition, a separate finger assembly may be used to clamp the pull-in cable against the winch drum, to keep the cable tightly coiled on that drum. This helps the cable to reel evenly, thereby prolonging its operating life. Conveniently, a single spring may be used for applying force both to the brake block, and to the coiling control finger unit. Figure 7 shows  
30 one format on this arrangement.

Such a quick release system could result in the gate opening in less than one second. It would not be practical to provide this level of performance in a

conventional gate system. Further, this arrangement saves a considerable power consumption, allowing the gate to be utilised in applications which are power sensitive.

In order to operate smoothly, it is highly preferable for the main and pull-5 in cable to run centrally into the master post, but for the winch drum to be located with considerable offset from the centre line. This arrangement provides better internal space for the various other gate mechanisms. Further, the pull-in cable should be fed onto the winch drum in such a manner that it reels on neatly and evenly.

10 Additionally, it is useful for the gate control system to be able to sense an overload condition, thereby allowing appropriate control action to be taken in this event.

Referring now to Figure 8, in order to achieve this a simple fixed pulley is used to re-direct the pull-in cable (from the centre-line) around a second pulley 15 mounted on a spring-loaded swinging arm. By this means, at low loads the pull-in cable alignment may be offset to one side of the winch drum, but as the cable load increases then the swinging arm will pivot to cause the pull-in cable to track across the winch drum surface. A limit stop is ideally provided to establish the minimum load position, and the selected spring characteristic determines the 20 rate at which the cable is offset versus load. A limit switch may be provided to detect abnormally high cable loads, and used as an input to an associated control system able to cut power to the drive, or take other appropriate control action.

It is a characteristic of the cable gate of the preferred embodiment, that 25 the pull-in load required to close the gate will initially be small, but will increase to a maximum level once the gate is fully closed. Similarly, the cable should be tracked across the winch drum at the rate of one cable width per drum rotation.

Through the selection of an appropriate spring design, the present invention is able to approximately match these two characteristics. That is, as 30 cable is reeled in and the main cable is raised, then the increasing cable tension forces will cause the cable to be tracked across the winch drum at an approximately correct rate. Therefore, the cable will be reeled in neatly and

evenly, and abnormally high loads will be detected by the limit switch.

In certain applications, the functionality of a cable gate may be enhanced using multiple cables, signs, and panels etc. These additional features would be attached to (or may form part of) the main cable, and could be raised by it.

5 the only requirements should be that the attached components must allow the main cable to slide through them, they must collapse fully to ground level, and they must be compatible with the passage of vehicular traffic over them.

For example, horizontal and vertical cables may be attached, or a sign may be hung from the centre of the gate span (so that vehicle wheels could track

10 either side of the sign). A second (or more) cable(s) may be anchored near the base of both the master and passive posts, and raised by vertical tie cables attached to the main cable by sliding joints. When opened, the main cable would slide through these vertical ties, allowing the entire assembly to drop to the road surface.

15 Alternatively, the main cable may be anchored at a low point on the master post, but pass through pulleys spaced apart in the passive post, to return to the normal latch position on the master post. When opened, the entire cable would thereby be allowed to drop to ground level.

Ideally, it is necessary to detect both that the latching pin is in the locked  
20 position, and that the cable end (eg. thimble) is correctly in position, to be assured that the gate is fully and correctly locked. It is insufficient to only detect the position of a thimble, as this could occur without the latching pin being in place. Similarly, in the preferred embodiment the latching pin is raised prior to entry of the cable end, and therefore does not indicate a "locked-gate" condition.

25 It would be possible to utilise separate micro-switches to detect both that the cable end is in place, and that the latching pin is raised. However, this would require additional switch mounting and wiring etc., which is not preferred due to the additional space, wiring, and costs involved. An alternative is to mount a single limit switch onto the pivoting latch pin assembly, arranged to  
30 detect the presence of the cable end only when the latch is in the raised position. This method is also not preferred, as the limit switch is exposed to high vibration loads, and its wiring is subject to fatigue failure due to multiple

bending.

As shown in Figure 9, in an alternative arrangement a cam surface carried on the latch pin assembly is generated to form a radius about the pivot point of that pin assembly in the absence of the cable thimble. A spring-loaded 5 cam follower, mounted on a swing arm attached to the frame of the gate mechanism, is arranged to just clear this cam surface. However, if the cable thimble is in place when the latch pin is raised, the cam is caused to rotate to a position outside of the original radius. This in turn causes the cam follower to be activated, which motion may be easily sensed using a fixed micro-switch.

10 This therefore allows for the use of a single, fixed, micro-switch to reliably detect both that the latch is in the locked position, and that the cable thimble is in place.

Modifications and variations to the cable gate of the present invention may be apparent to one skilled in the art upon reading of this disclosure and 15 such modifications and variations form part of the scope of the present invention.

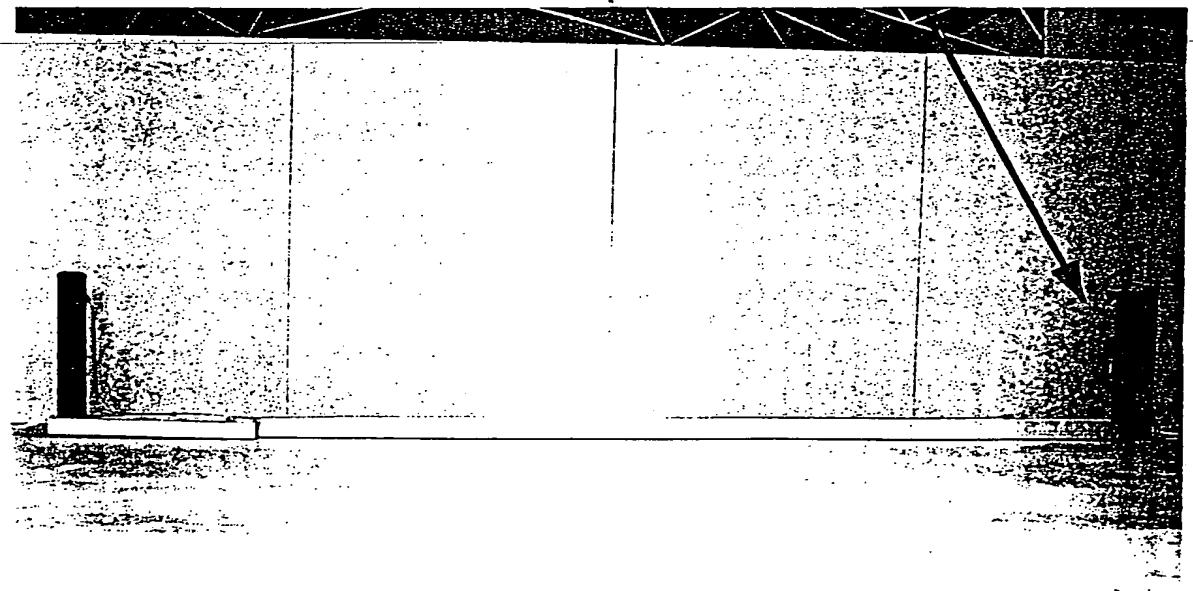
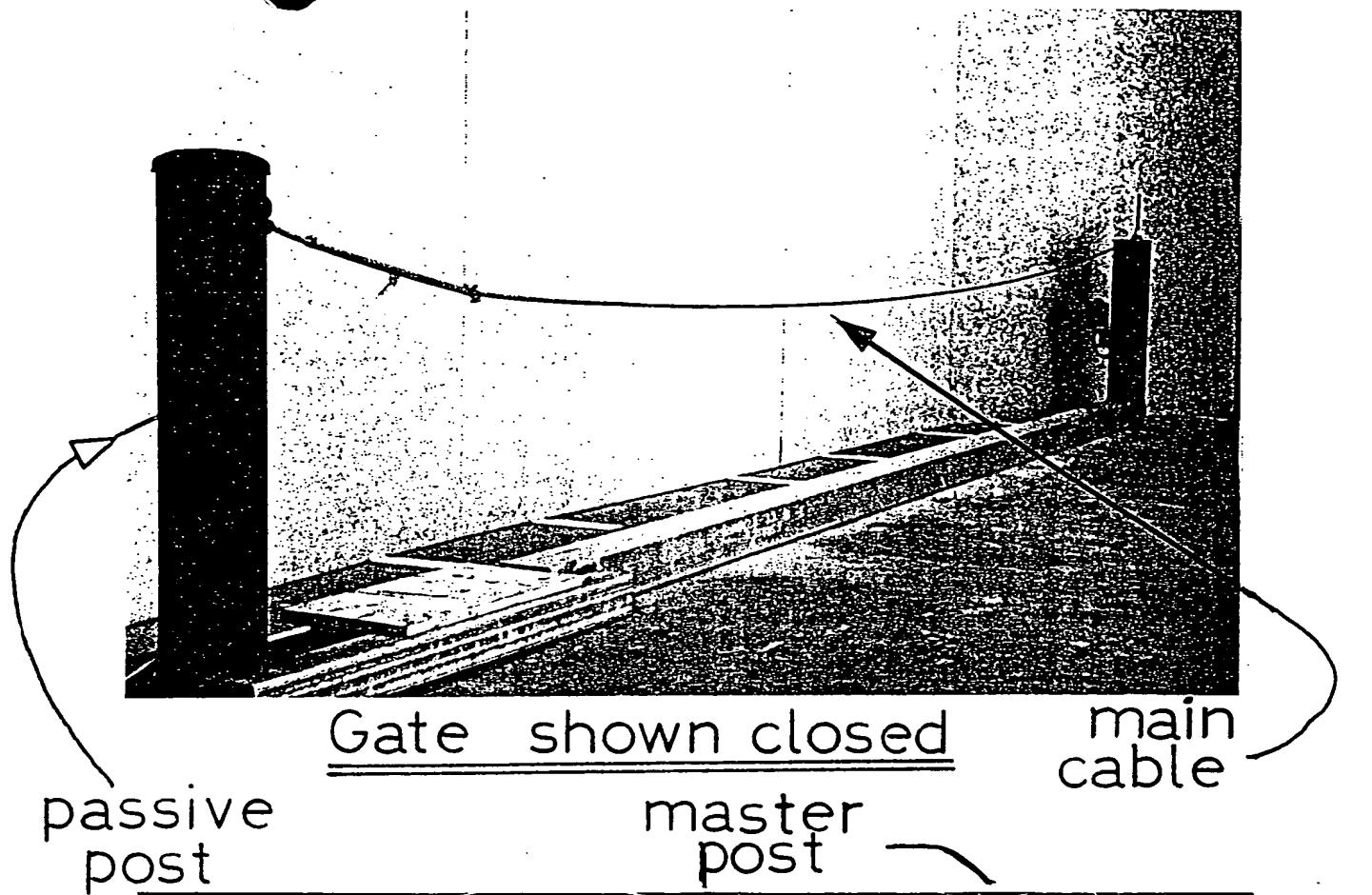
DATED this 1st Day of October, 1998.

MATILDA PRODUCTS LTD

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WATERMARK PATENT & TRADEMARK ATTORNEYS  
4TH FLOOR "DURACK CENTRE"  
263 ADELAIDE TERRACE  
PERTH WA 6000





Gate open

Fig. 1a – Basic Format

Fig 1b - Basic Format

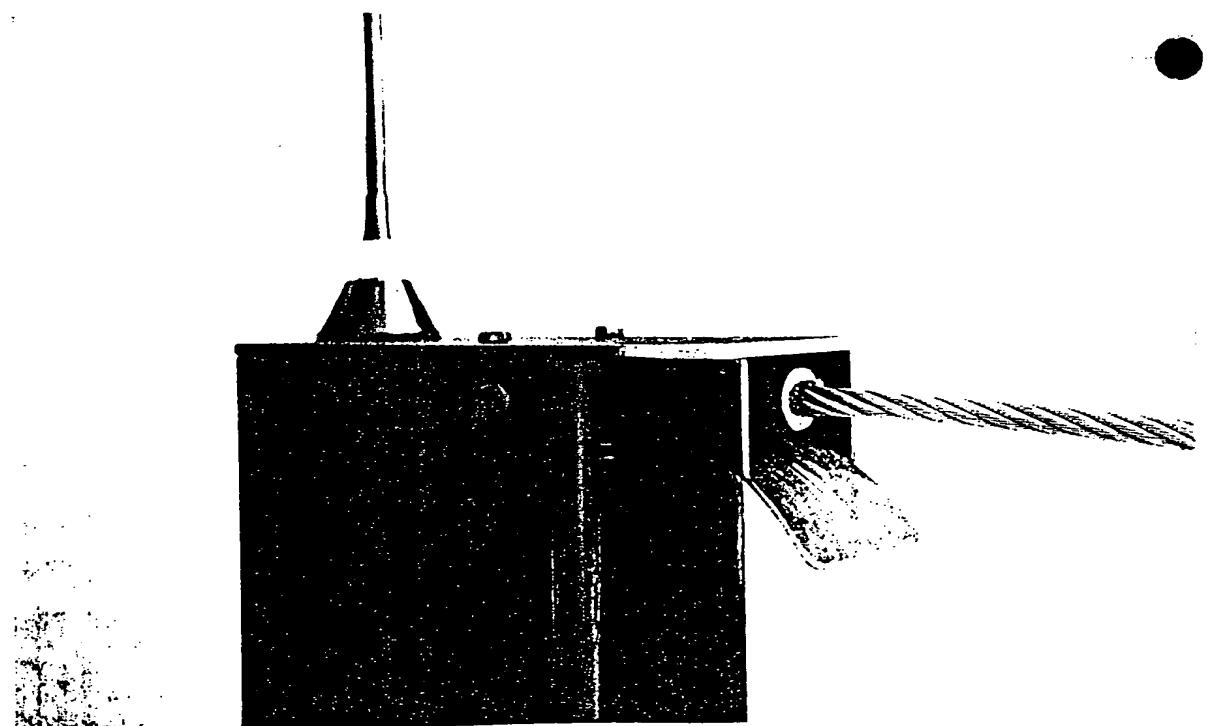
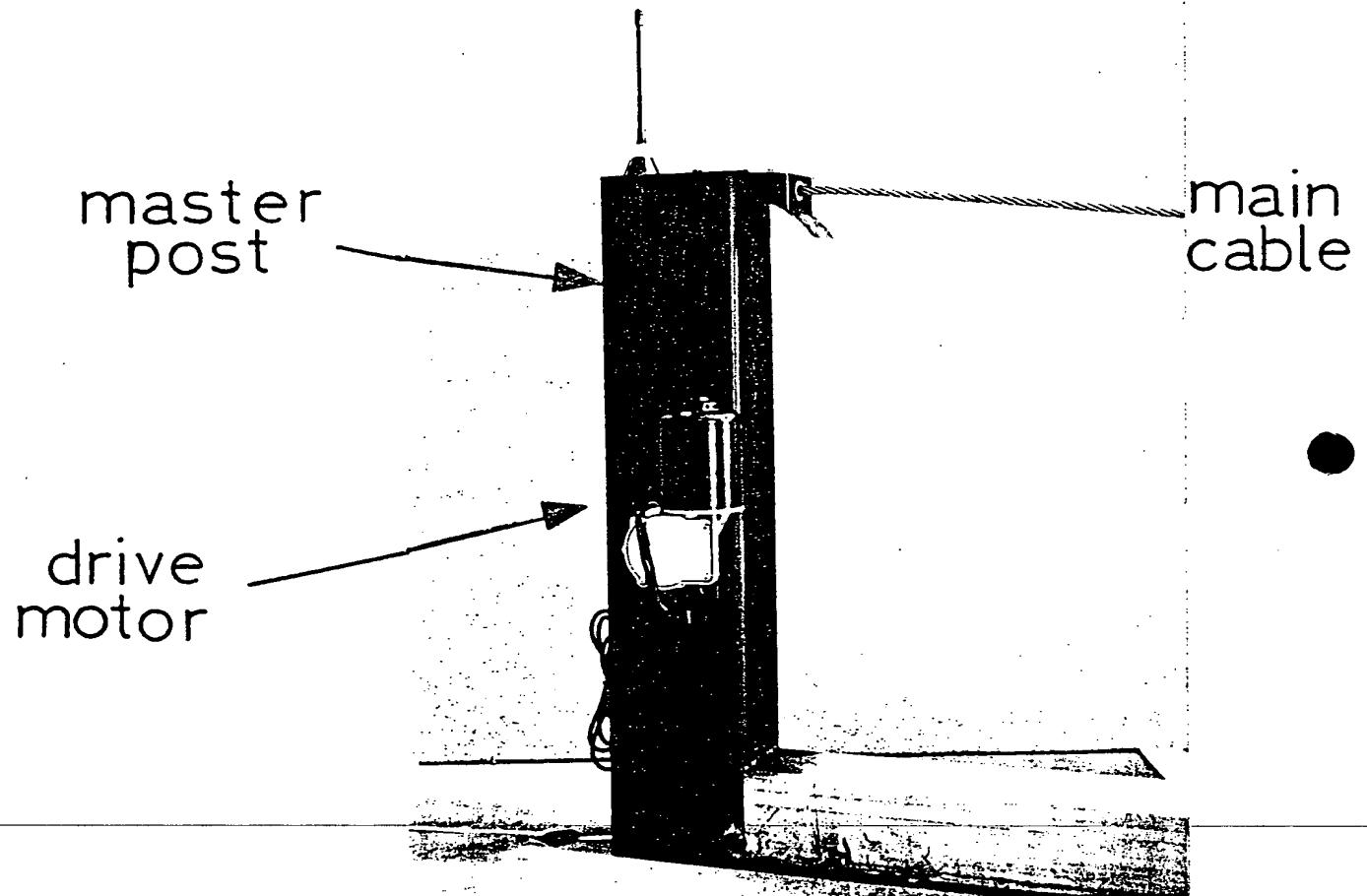


Fig. 2a – Basic Invention

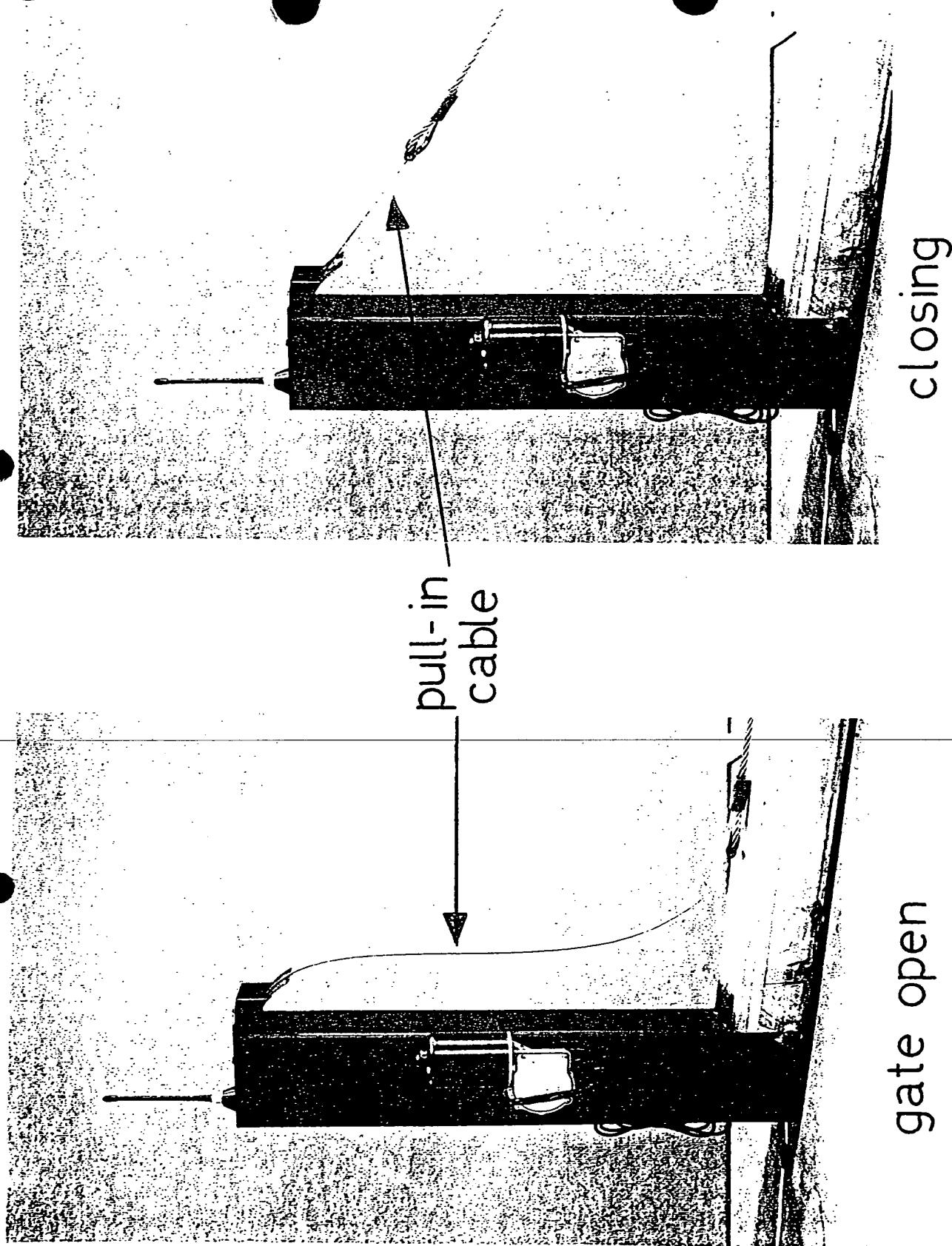
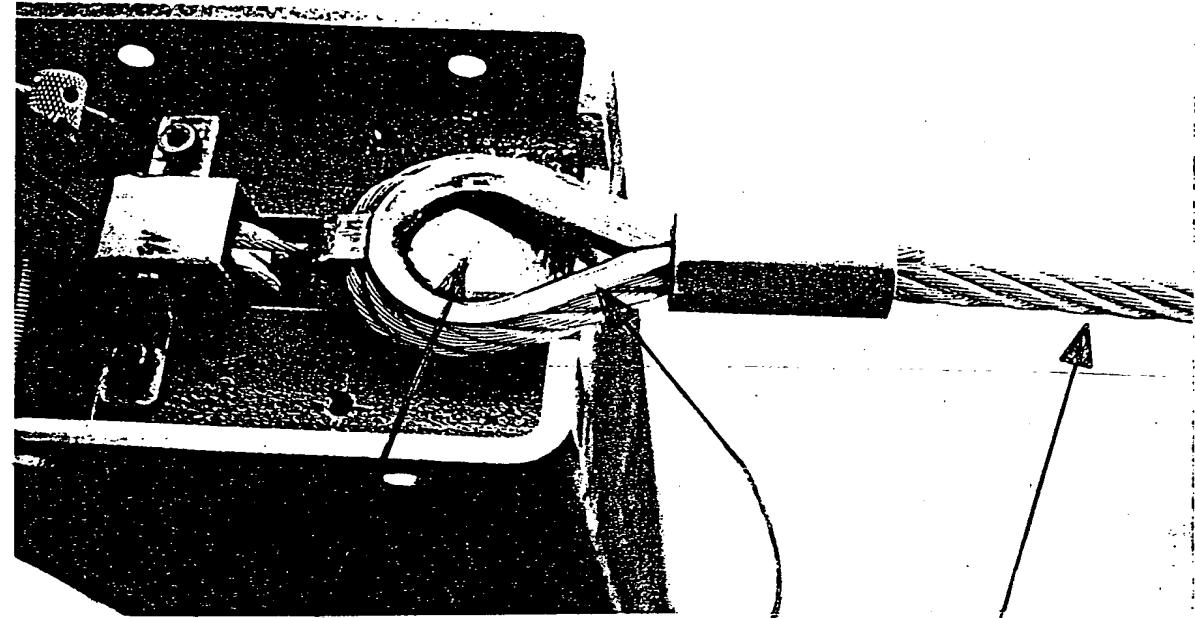


Fig. 2b - Basic Invention



latch pin      thimble      cable

release lever      pivot

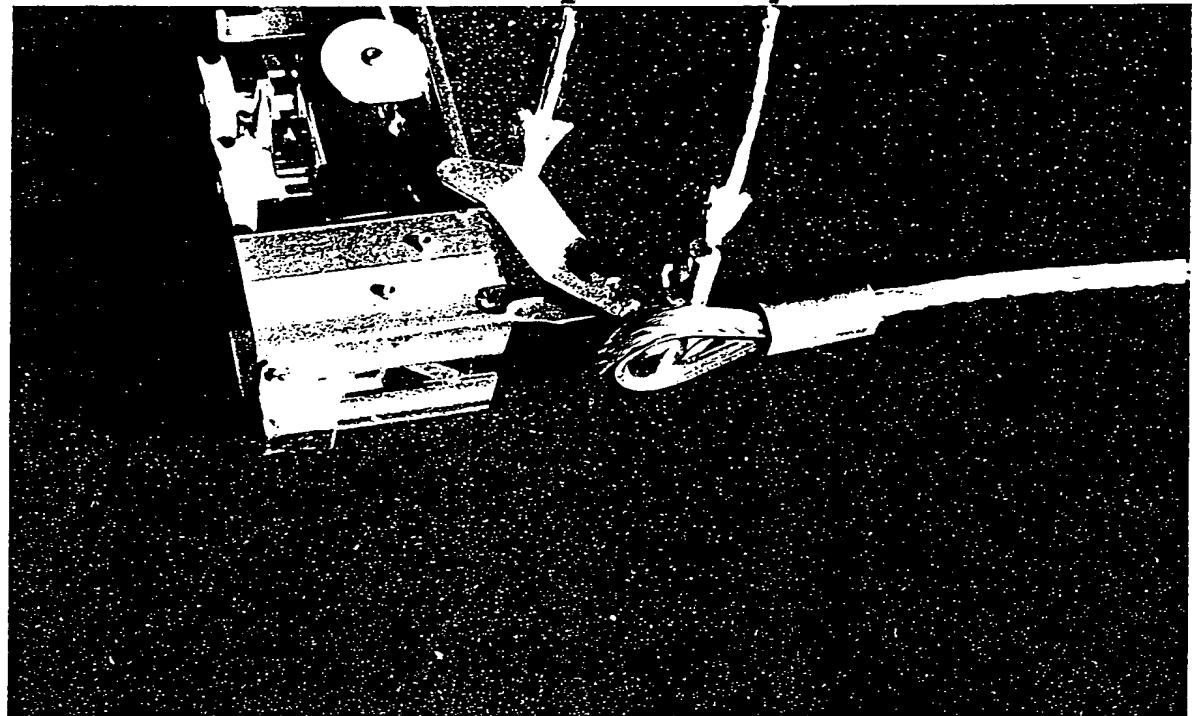
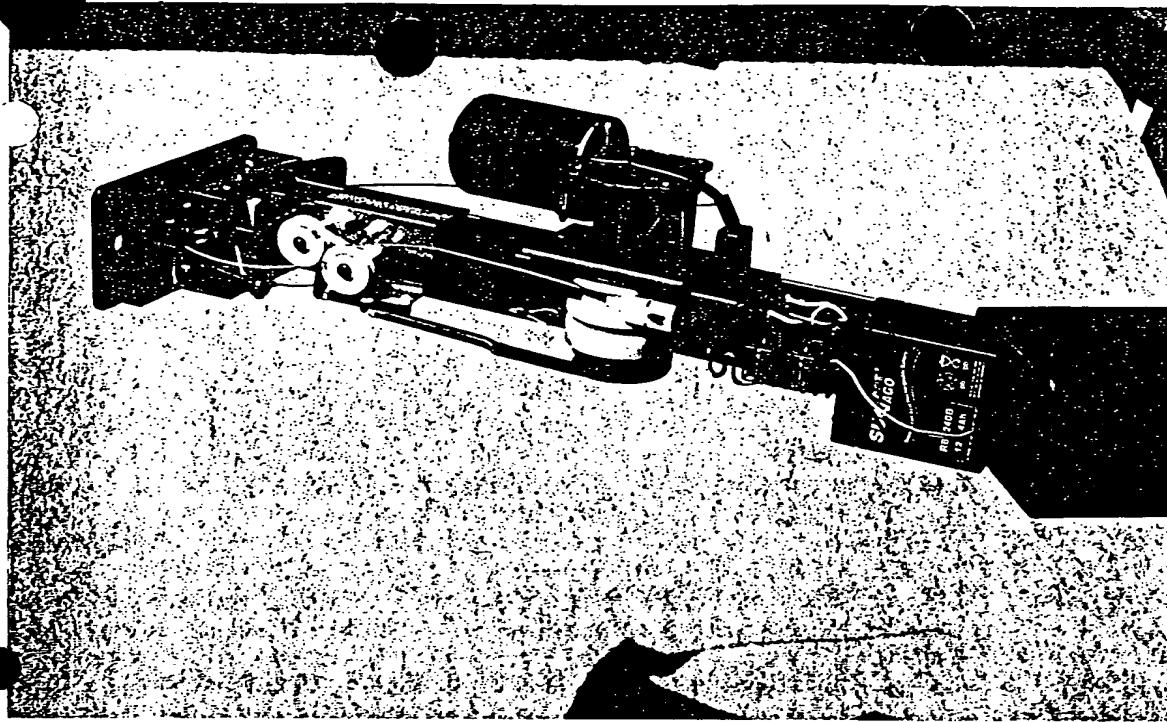


Fig. 3a – Drive Mechanism

complete internal assembly



motor drive

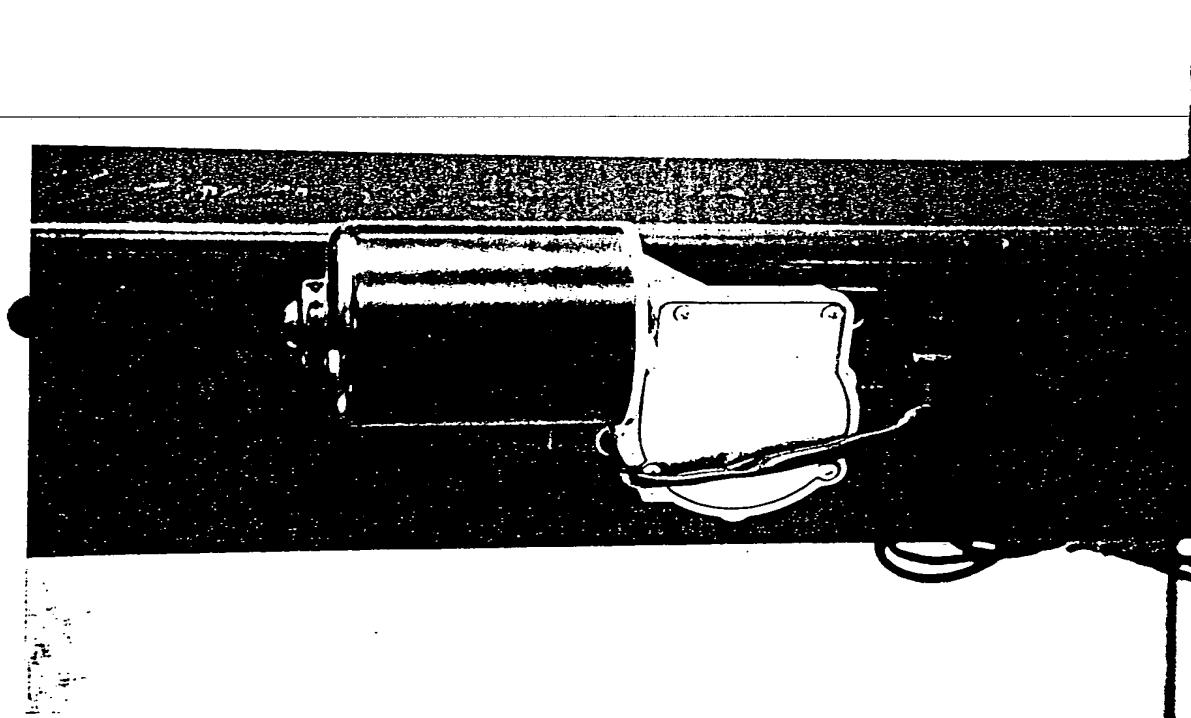
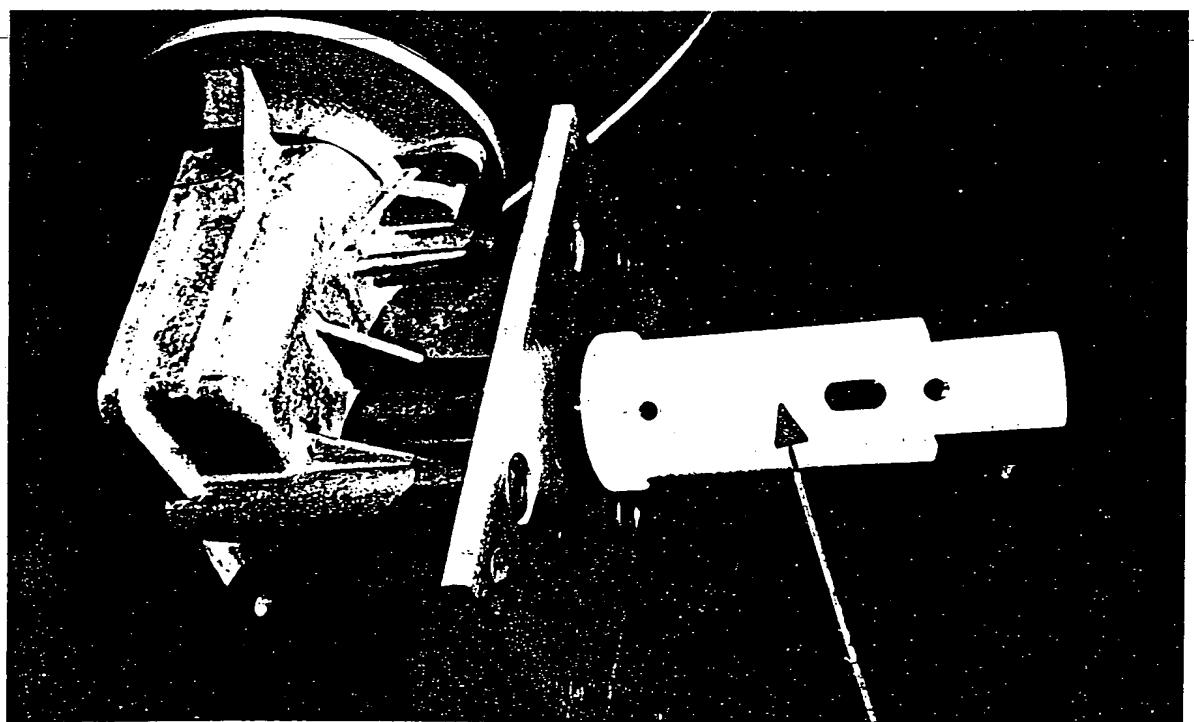
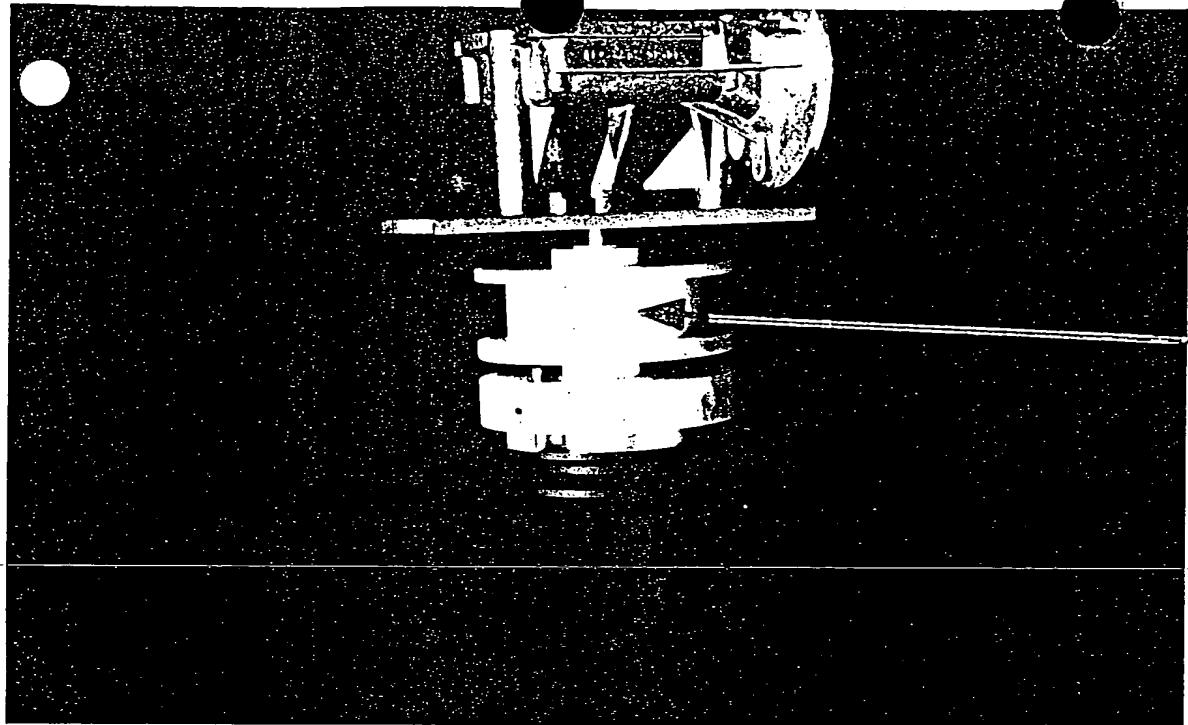


Fig. 3b - Drive Mechanism

winch drum



winch  
(drive)  
shaft

Fig. 4a - Latch Release

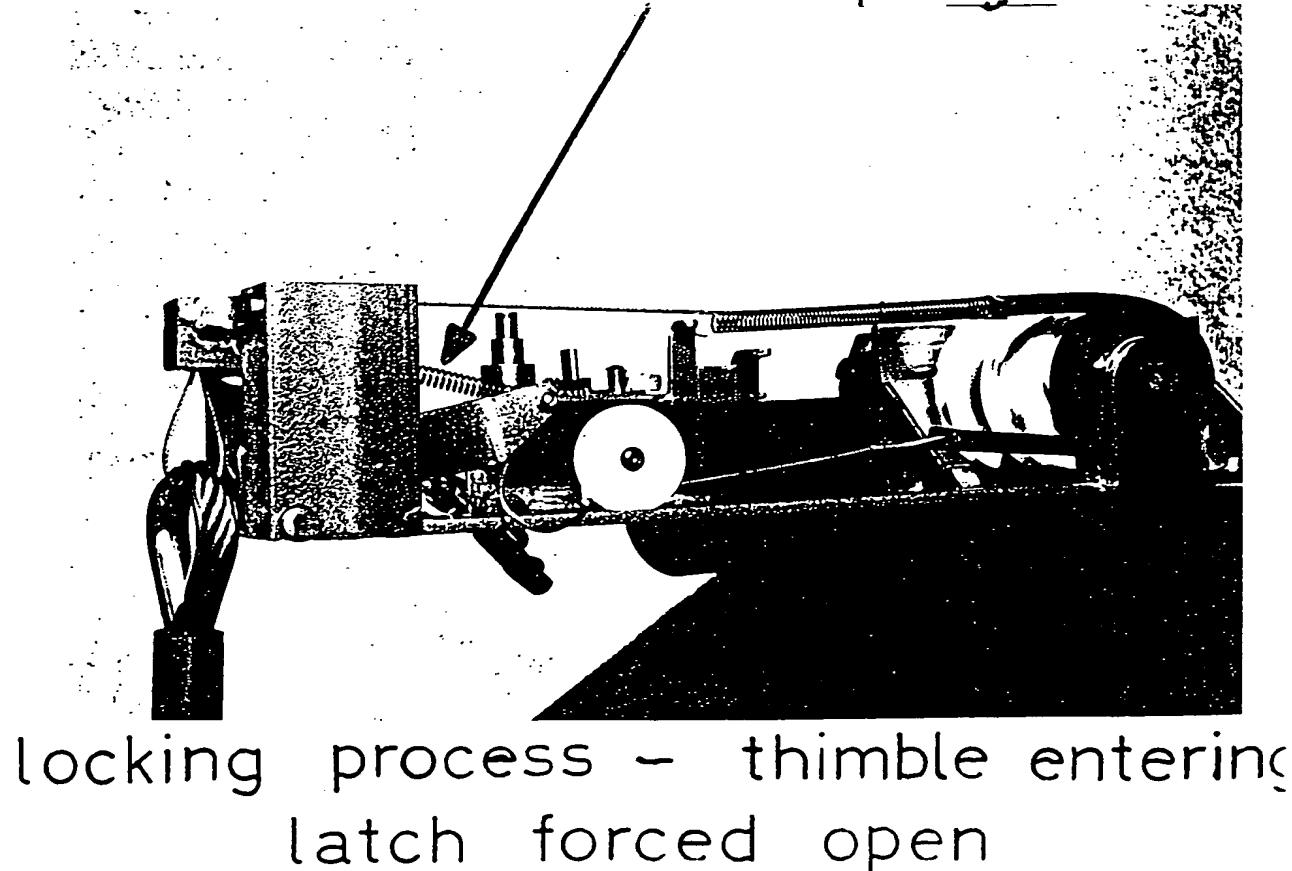
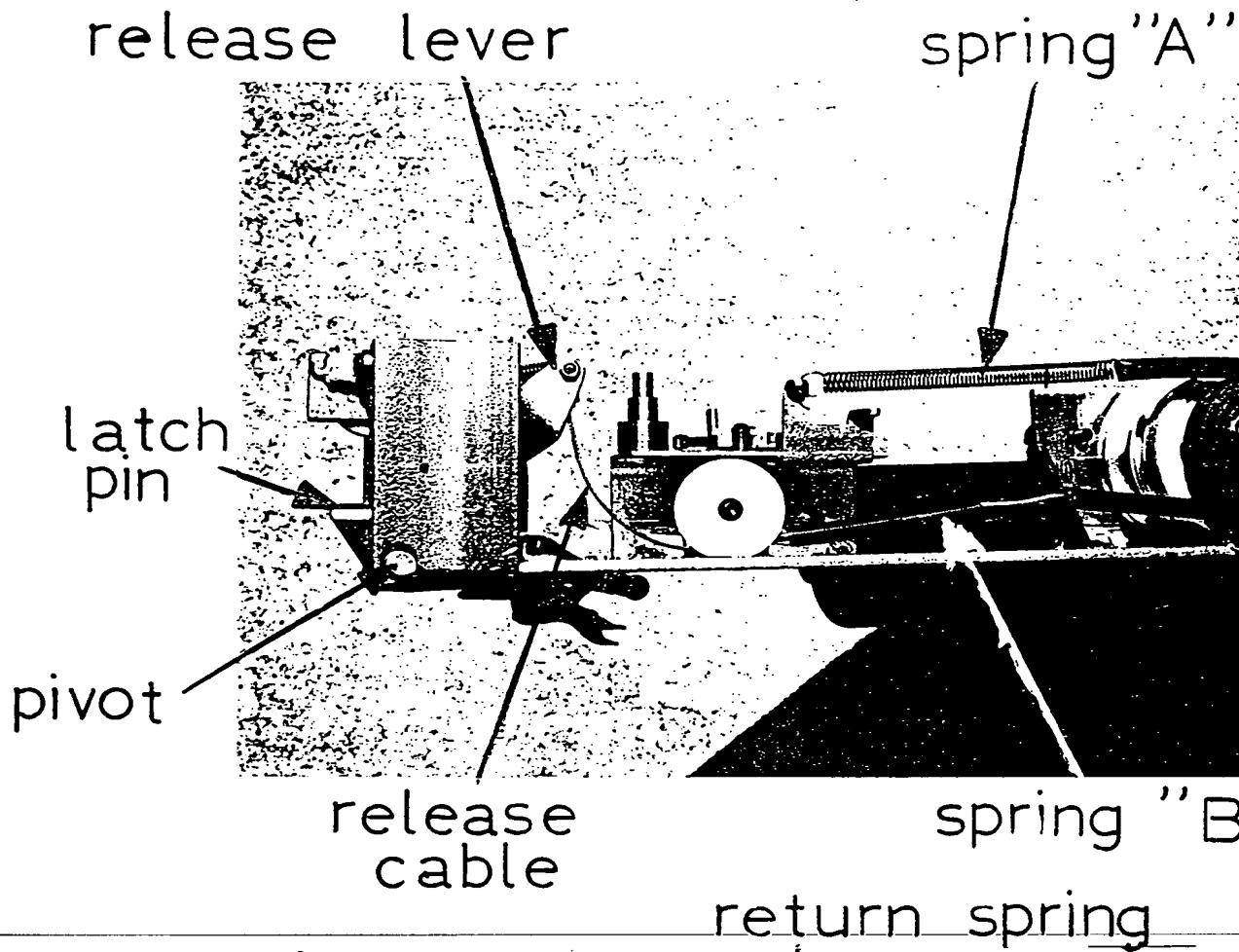
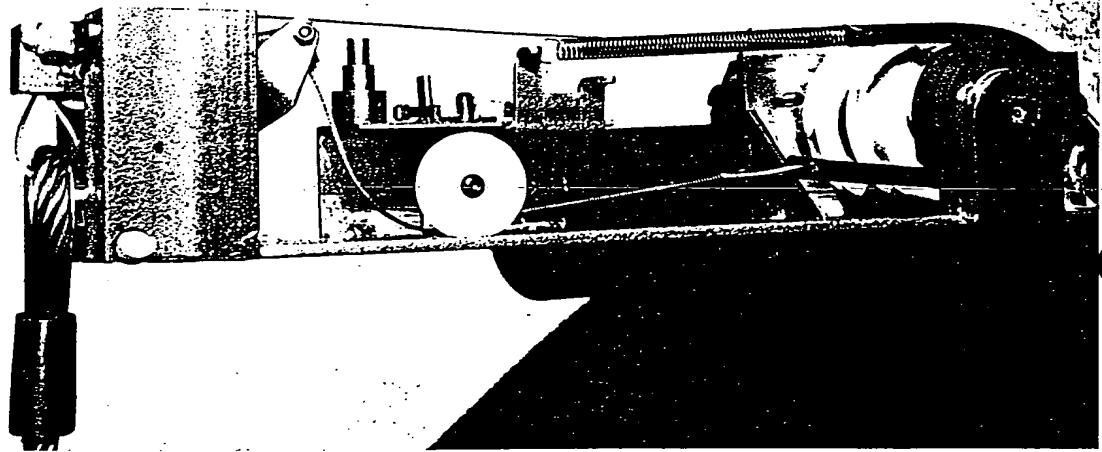
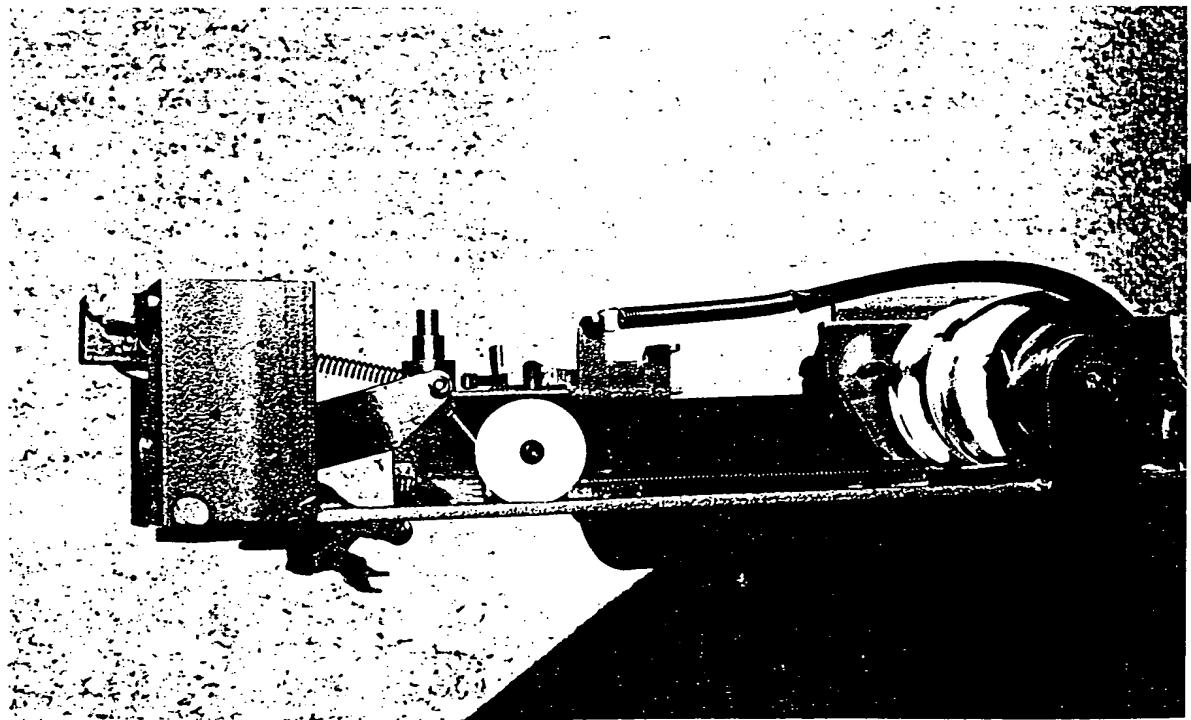


Fig. 4b - Latch Release

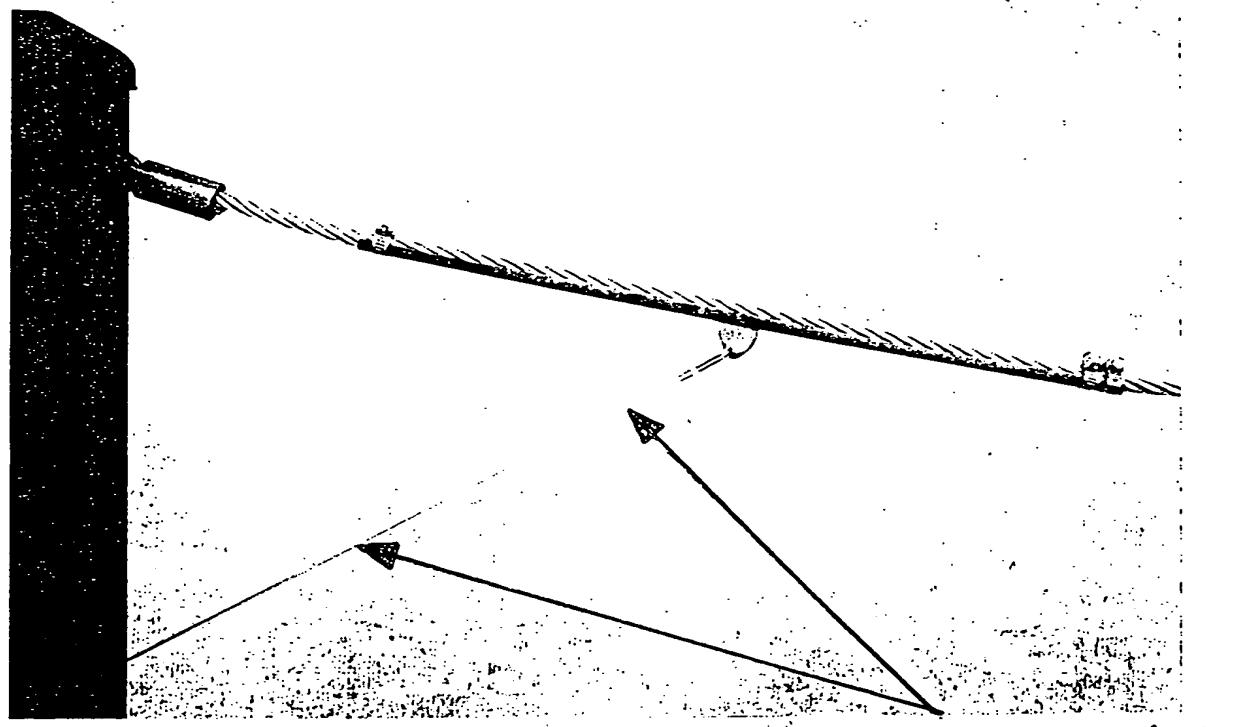


cable & latch in place - gate locked

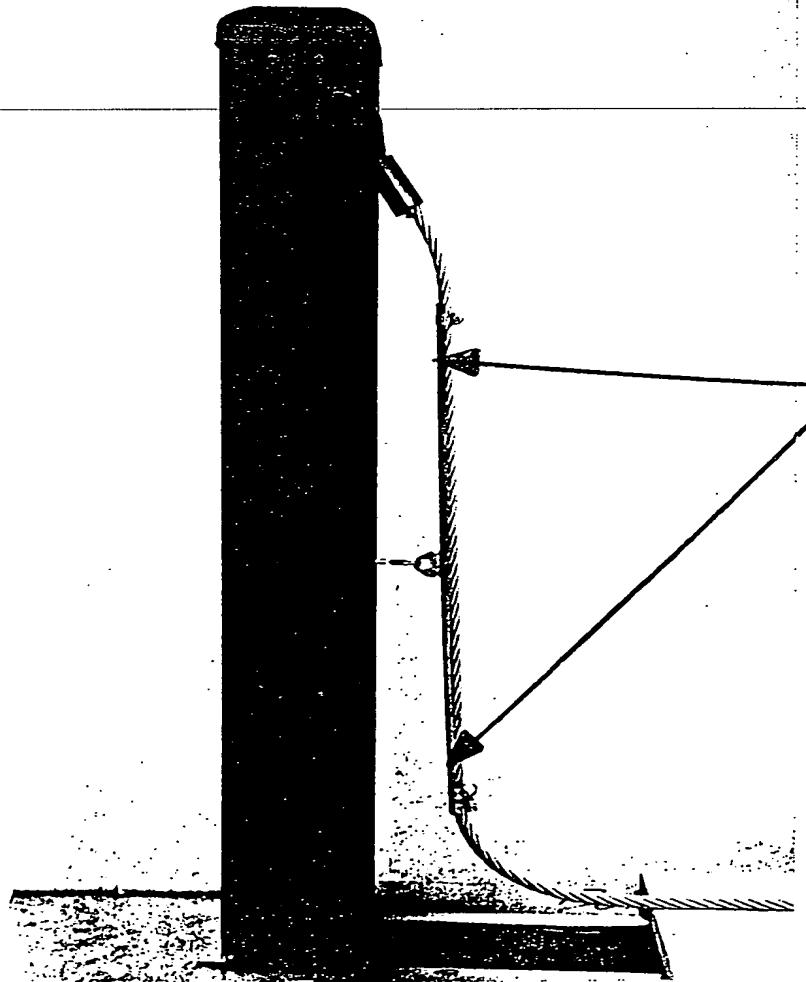


drive reversed - latch forced open

Fig. 5 - Passive Post



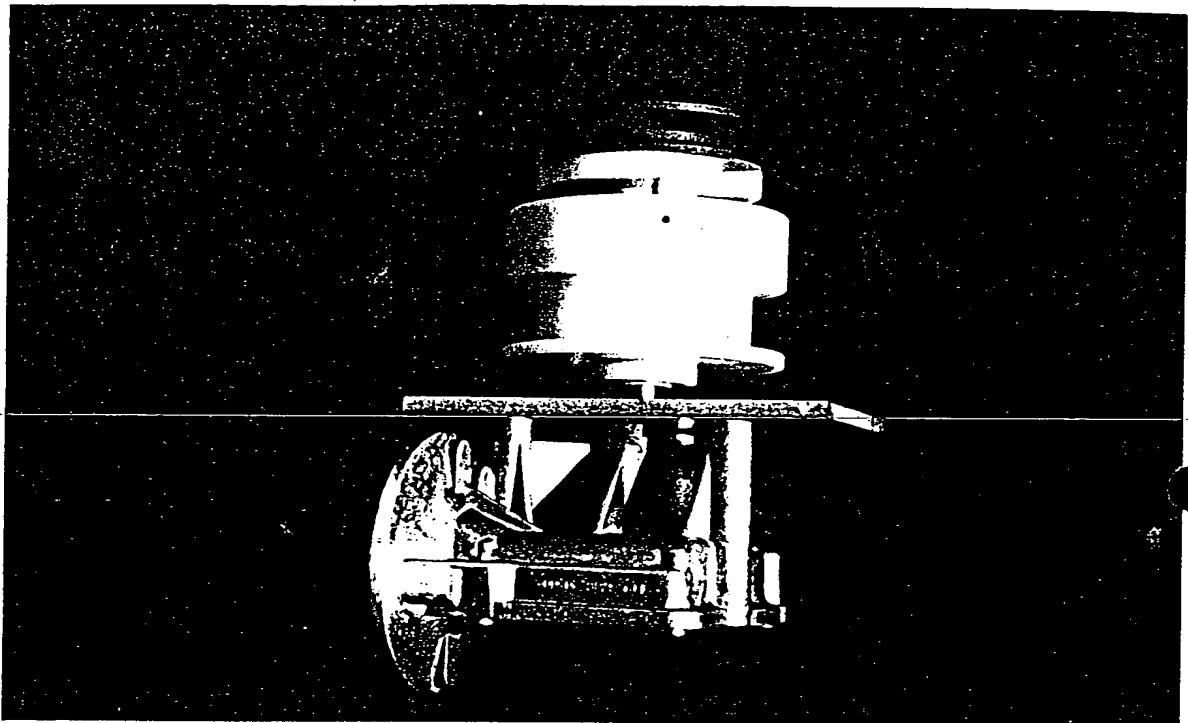
counterweigh  
cable



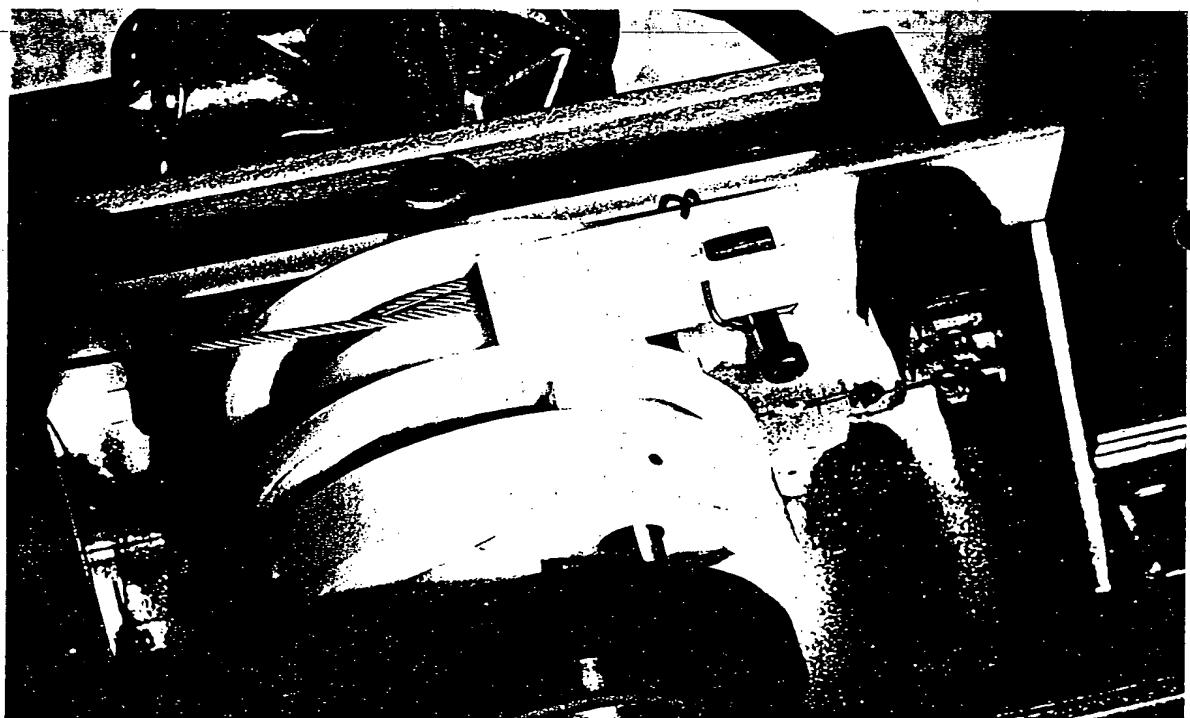
spreader  
bar

gate open

Fig. 6a - Quick Release



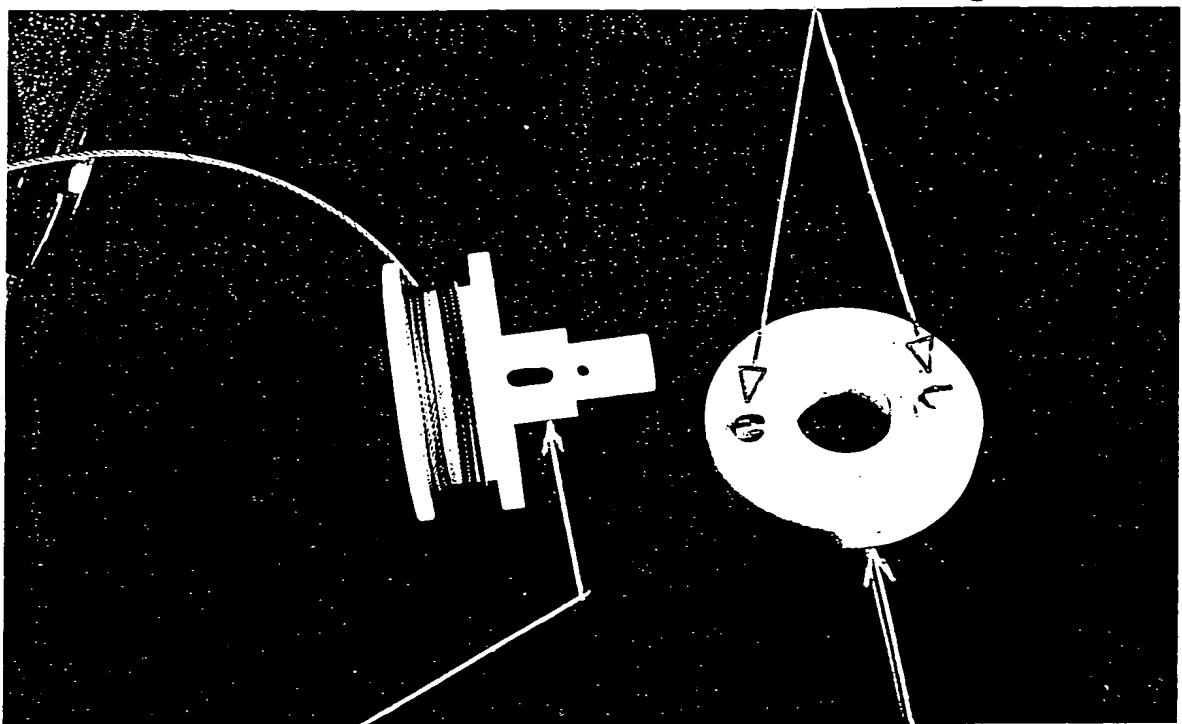
complete drive assembly



quick release arrangement

Fig.6b - Quick Release

clutch dogs

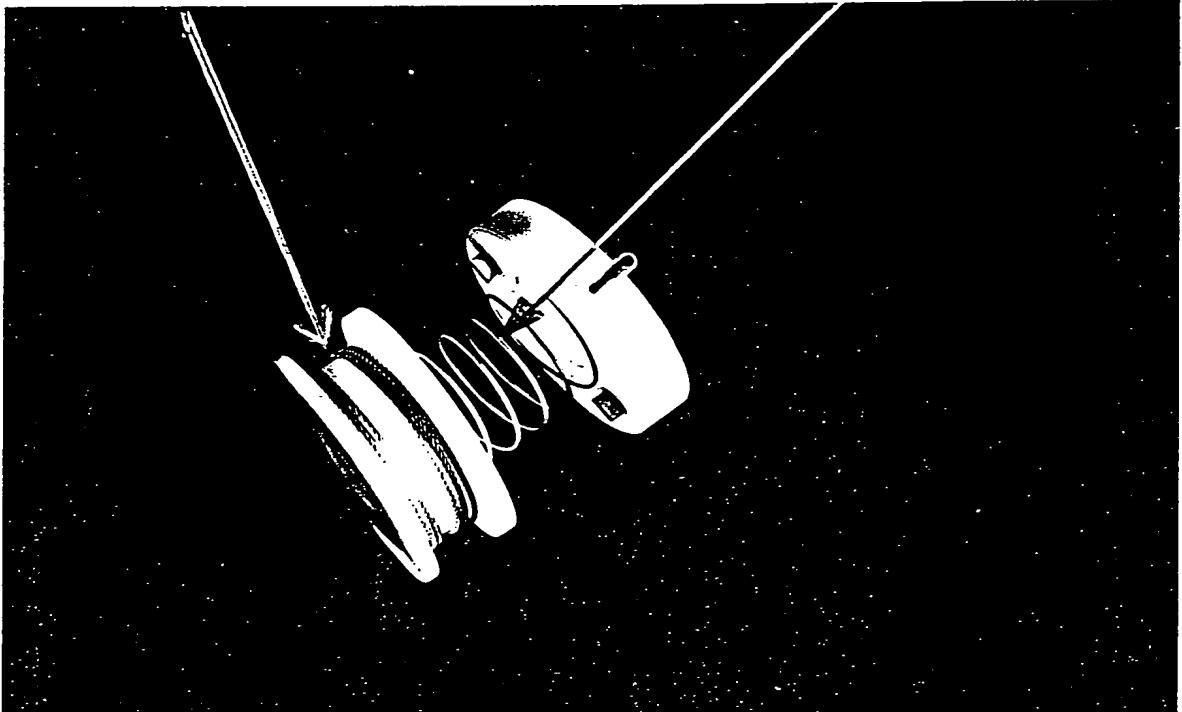


drive shaft

drive collar

winch drum

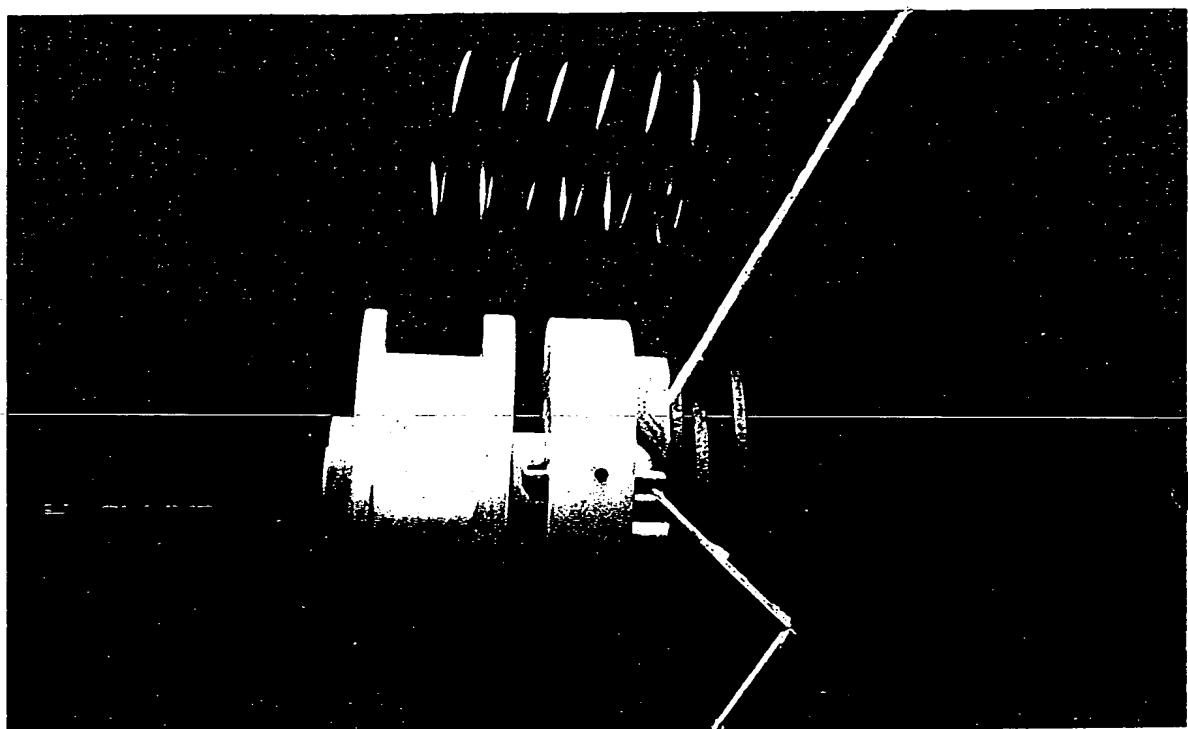
release spring



clutch system

Fig. 6c - Quick Release

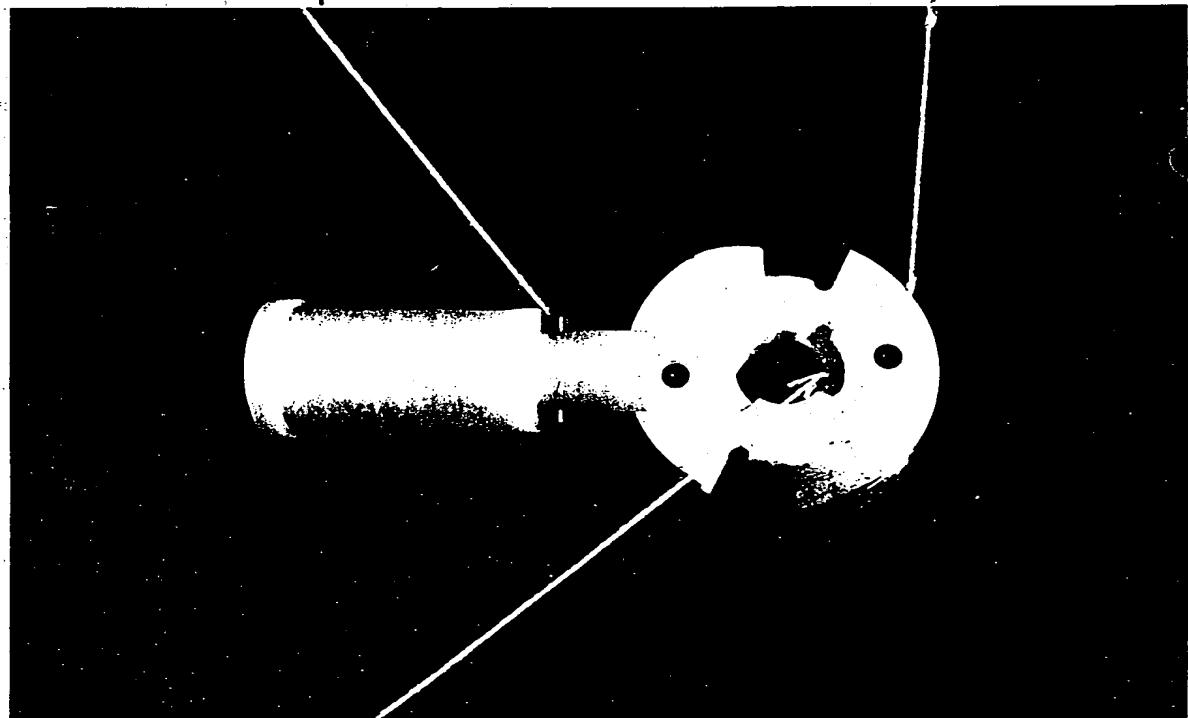
face cam



cam follower

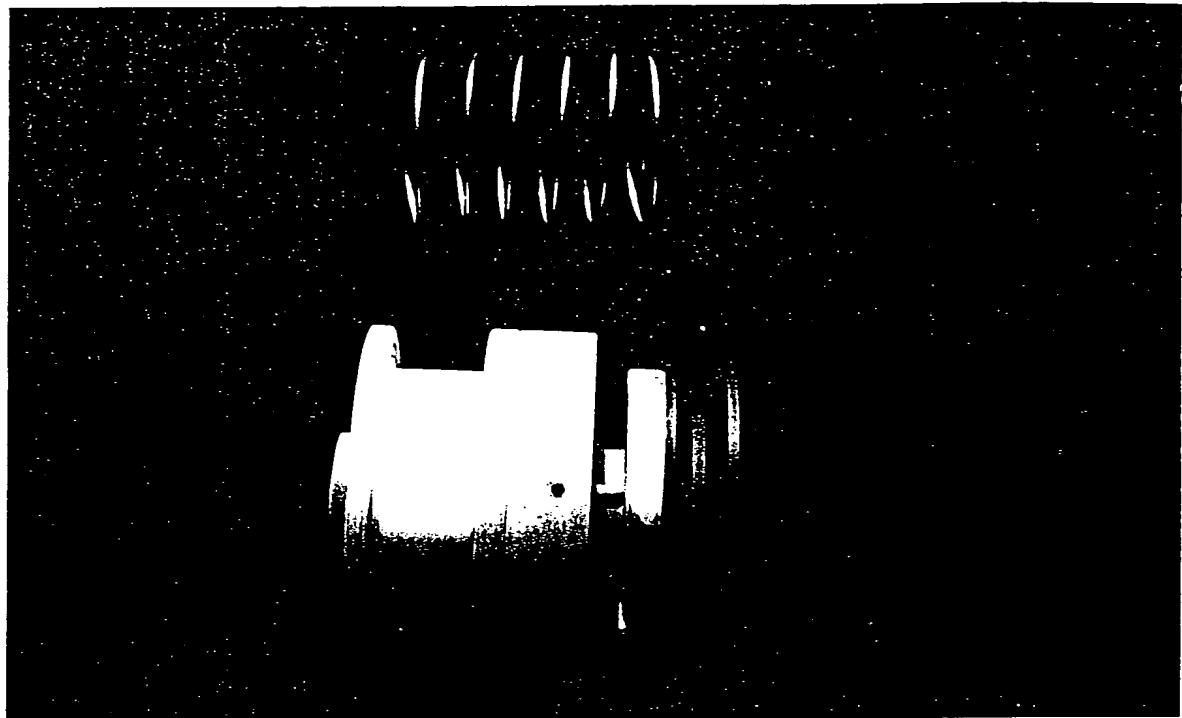
drive pin

cam hub

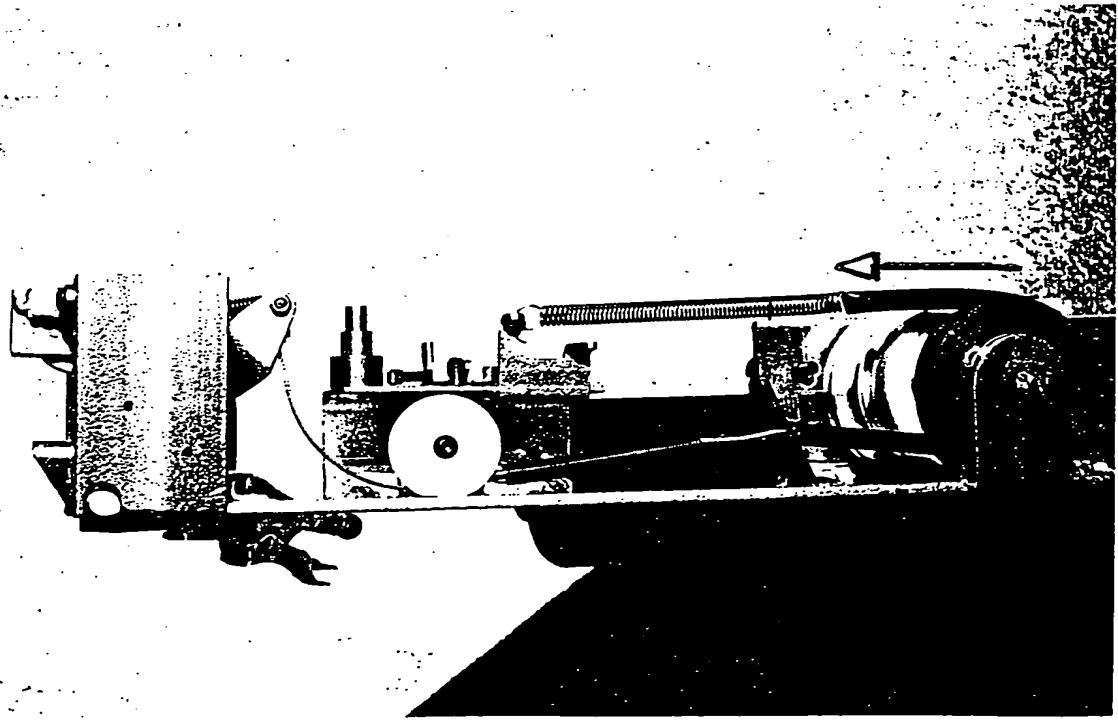


segmented slot

Fig. 6d - Quick Release

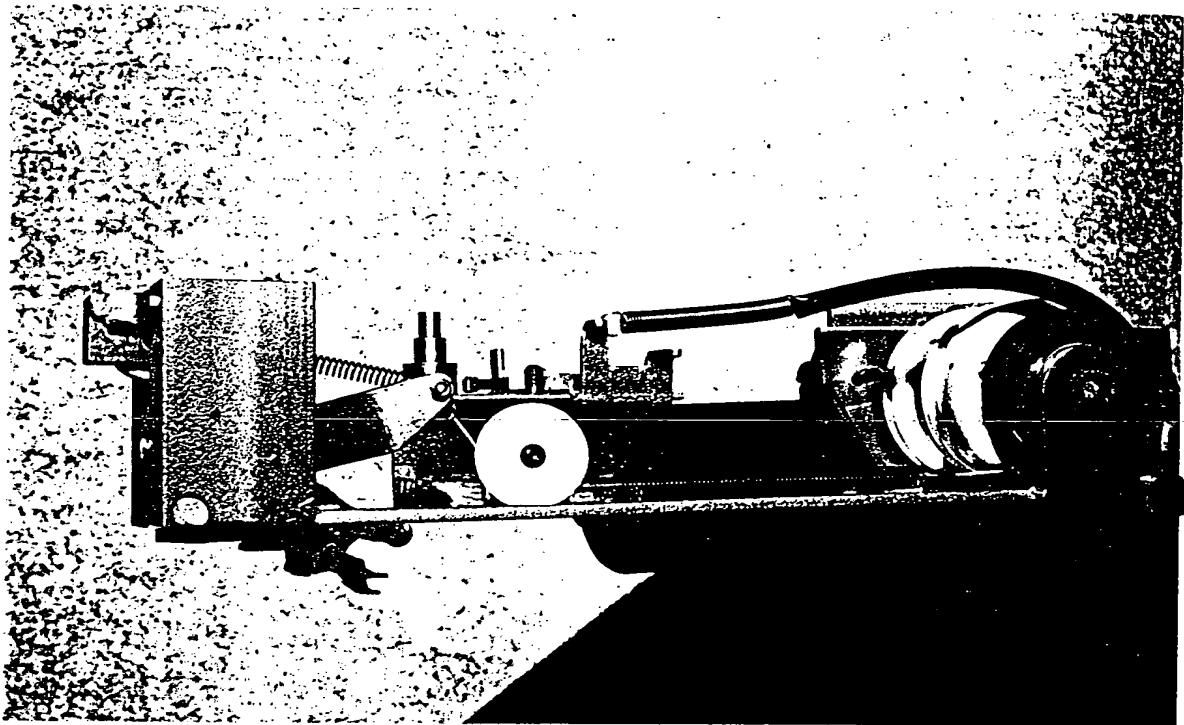


clutch engaged



retarding force engages clutch

Fig. 6e - Quick Release



opposite rotation releases clutch  
allowing rapid opening

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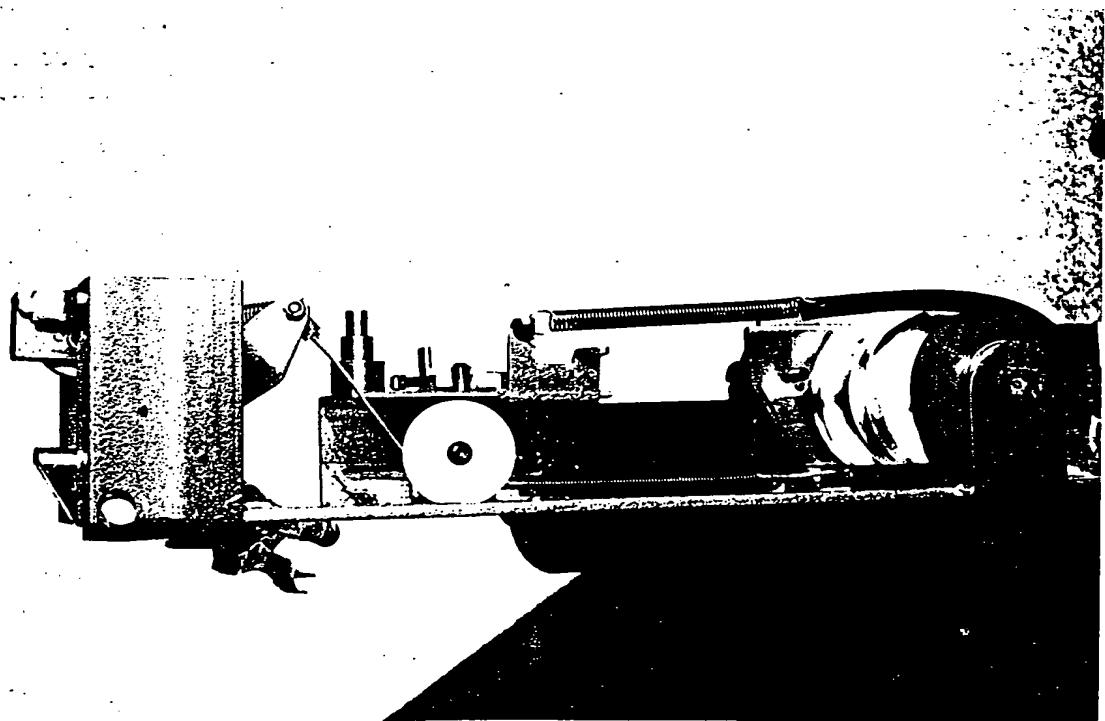
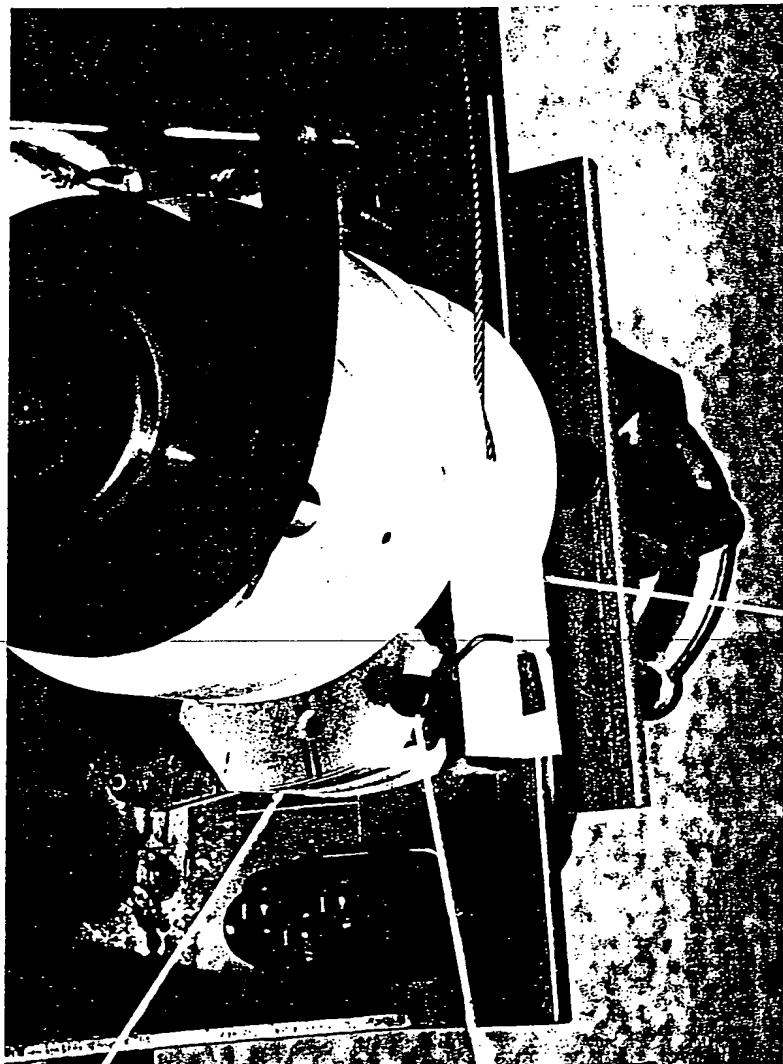


Fig. 7 - Winch Brake Unit



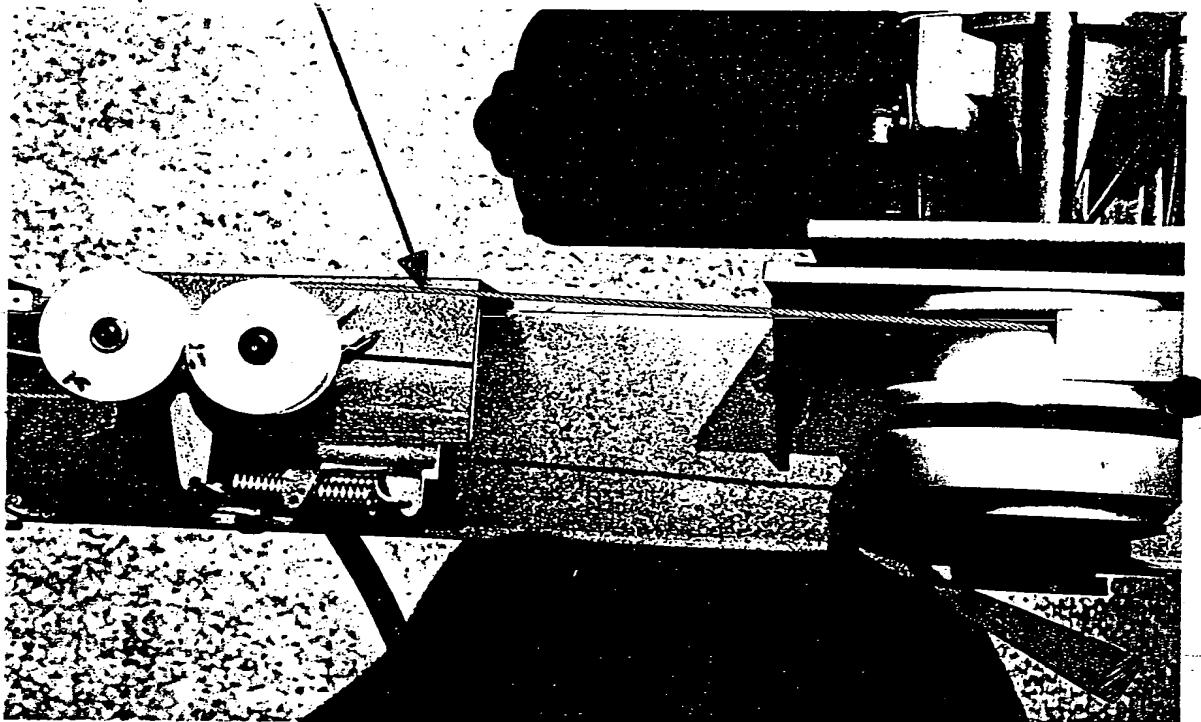
coiling finger

— pivot

brake  
block

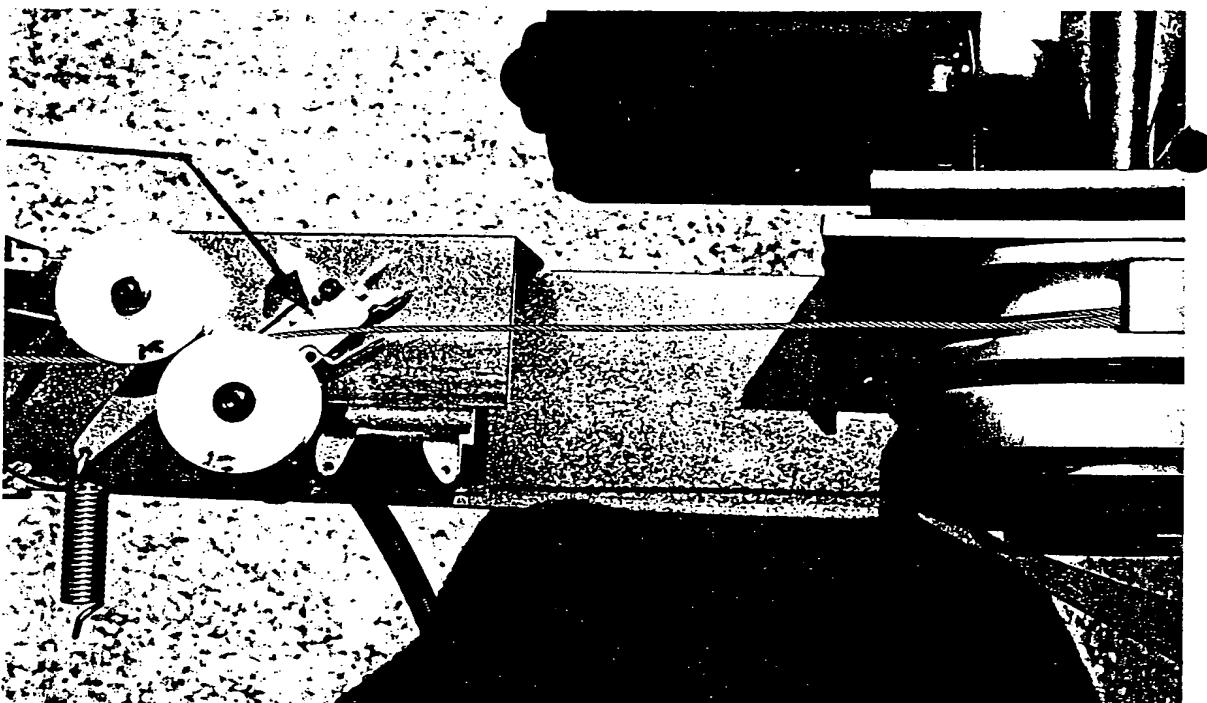
Fig. 8 - Cable Tracking Device

pull-in cable



low-load state

micro-  
switch



high load

Fig. 9 - "Locked" Detection

cam

sensing finger

follower

swing-arm

"locked" sensing

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